



Greenstar Highflow CDi gas-fired condensing combi floor standing boiler series

NEW
Greenstar
Comfort
controls

 **WORCESTER**
Bosch Group



Worcester and you. Making a difference.

As part of the Bosch Group, Worcester products are designed and manufactured to provide customers with the highest levels of quality and reliability which are synonymous with the Bosch name throughout the world.

As part of Europe's largest supplier of heating products, Worcester, Bosch Group has the UK-based resources and support capability to offer you the value-added solutions you deserve. Worcester employs a nationwide network of Service Engineers and technically trained Field Sales Managers

supported by an experienced technical services team which is able to provide comprehensive support and advice from designing system layouts through to installation.

Worcester is dedicated to providing energy efficient gas- and oil-fired condensing boilers, as well as an extensive range of renewable technologies. All of our products have been developed and introduced with the aim of helping the UK to achieve the Government's efficiency targets.



BOSCH
Invented for life



The reception and main entrance
at our Worcester headquarters

“At Worcester we recognise the vital role you play in the specification and installation of energy efficient appliances in homes across the UK. We will continue to invest in our products, people, facilities and added value services to ensure you have all you require in order to deliver only the best solutions to your customers’ requirements.”

Carl Arntzen,
Managing Director,
Bosch Thermotechnology Ltd.

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Key features of the range



Outstanding performance

The Greenstar Highflow CDi series is a well-established range of energy-saving, floor-standing, gas-fired combi boilers which incorporate a host of features that benefit the installer, the end user and the environment.

Greenstar Highflow CDi combi boilers are renowned for their industry-leading hot water flow rates of up to 25 litres a minute. This, combined with rapid re-heat times makes them especially suitable for larger properties with multiple hot water outlets. They are able to deliver comparable flow rates to systems with an unvented mains cylinder without the need for a separate storage tank. As a result, baths fill more quickly and longer showers can be enjoyed, whilst the separate plated heat exchanger and thermal store ensures that hot water is delivered instantly on demand.

Winner of Which? Best Buy awards in 2011, 2012, 2013 and 2014

For four consecutive years, in a survey of Which? members, the Worcester Greenstar gas-fired condensing boiler range has been presented with Best Buy awards.* In the latest survey, no other manufacturer scored higher for reliability and customer satisfaction.

Ease of installation

The Greenstar Highflow CDi has been designed to make installation as straight forward as possible. The appliance is supplied with a floor mounted pre-plumbing jig which enables gas and water services to be installed before connection to the boiler is made. The boiler has a wheel-in tray which enables the appliance to be easily slid into place once the pipe connections have been made. This feature also makes maintenance and servicing easier.



The clean 'skin' design of Worcester Greenstar boilers is incorporated into the Greenstar Highflow CDi range.

The Greenstar Highflow CDi combi boiler series at a glance

| | | Greenstar Highflow 440CDi | Greenstar Highflow 550CDi |
|---------------------------------|-----|---------------------------|---------------------------|
| Part no. | | 7 715 330 041 | 7 715 330 040 |
| Output kW to DHW | Min | 7.4kW | 9.7kW |
| | Max | 29.5kW | 41.1kW |
| Flow rate at 35°C Δ T | | 20l/min* | 25l/min* |
| CH temperature control | | ✓ | ✓ |
| DHW temperature control | | ✓ | ✓ |
| Natural gas | | ✓ | ✓ |
| LPG boiler | | ✓ | ✓ |
| Electronic ignition | | ✓ | ✓ |
| 2005 SEDBUK value – natural gas | | 90.8% / A rated | 90.8% / A rated |
| 2009 SEDBUK value – natural gas | | 89.2% / A rated | 89.2% / A rated |

*Provided adequate mains water pressure and flow is available – see page 18 for further details.

Greenstar Highflow CDi

Features and benefits



Energy efficient

Greenstar Highflow CDi condensing combi boilers are SEDBUK A rated (2005). This means they have an average annual efficiency of 90.8%, compared to the 78% efficiency achieved by non-condensing boilers. Therefore, customers who upgrade to a Greenstar Highflow CDi boiler not only reduce their gas bills, they also reduce their carbon footprint.



Keep hot facility

The Greenstar Highflow CDi has an in-built 'keep hot' facility which will keep the primary water within the heat exchanger bank hot. This will ensure that hot water is delivered almost instantly to the opened outlet.

Controls

A choice of optional controls is available with Greenstar Highflow CDi boilers to enable your customers to select the type of control which best suits their individual requirements. The choice ranges from a simple-to-operate digital programmer to sophisticated wireless programmers, room thermostats and intelligent controls including the Wave smart control. For more on these, see pages 10-13.



Benefits to the installer

- Familiar design so no surprises during installation
- Tried and tested heat exchanger, as used in the popular wall-mounted Greenstar CDi Classic series, provides long and reliable service
- Ideal solution for properties with high hot water demand and multiple hot water outlets
- Uses standard Worcester multi-directional fluing options for ease of installation in a wide range of situations
- Supplied as standard with 12 litre expansion vessel, 3bar pressure relief valve, pressure gauge and automatic air vent
- Built-in condensate pump increases siting possibilities and helps to reduce the risk of frozen condensate
- Pump seizure protection reduces the risk of call-backs
- Easy to site with dimensions comparable to standard 'white goods' appliances.

Benefits to the end user

- Significant reductions in energy costs thanks to latest condensing technology and high efficiency heat exchanger
- Exceptional flow rates even with multiple hot water outlets
- Quick re-heat times
- Hot water at mains pressure without the need for a pump
- Frees up space by not requiring a hot water cylinder
- Modulating central heating and hot water outputs, combined with advanced Worcester controls, enable comfortable temperatures to be set independently of each other.

Peace of mind

Worcester Greenstar Highflow CDi boilers benefit from a full 5 year guarantee* on parts and labour and a 10 year guarantee* on the primary heat exchanger*.



On all Greenstar combi appliances*



On the primary heat exchanger*

Fluing options

The Greenstar Highflow CDi range has a full range of Condensfit II™ flue options in both 60/100mm and 80/125mm diameters and includes a plume deflector as standard. This versatile flue system can be run horizontally or vertically.

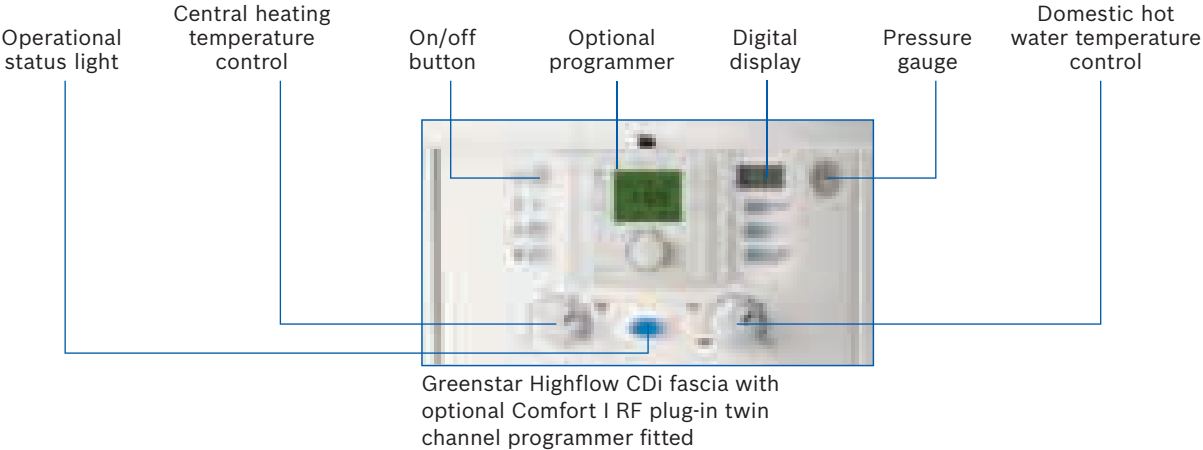
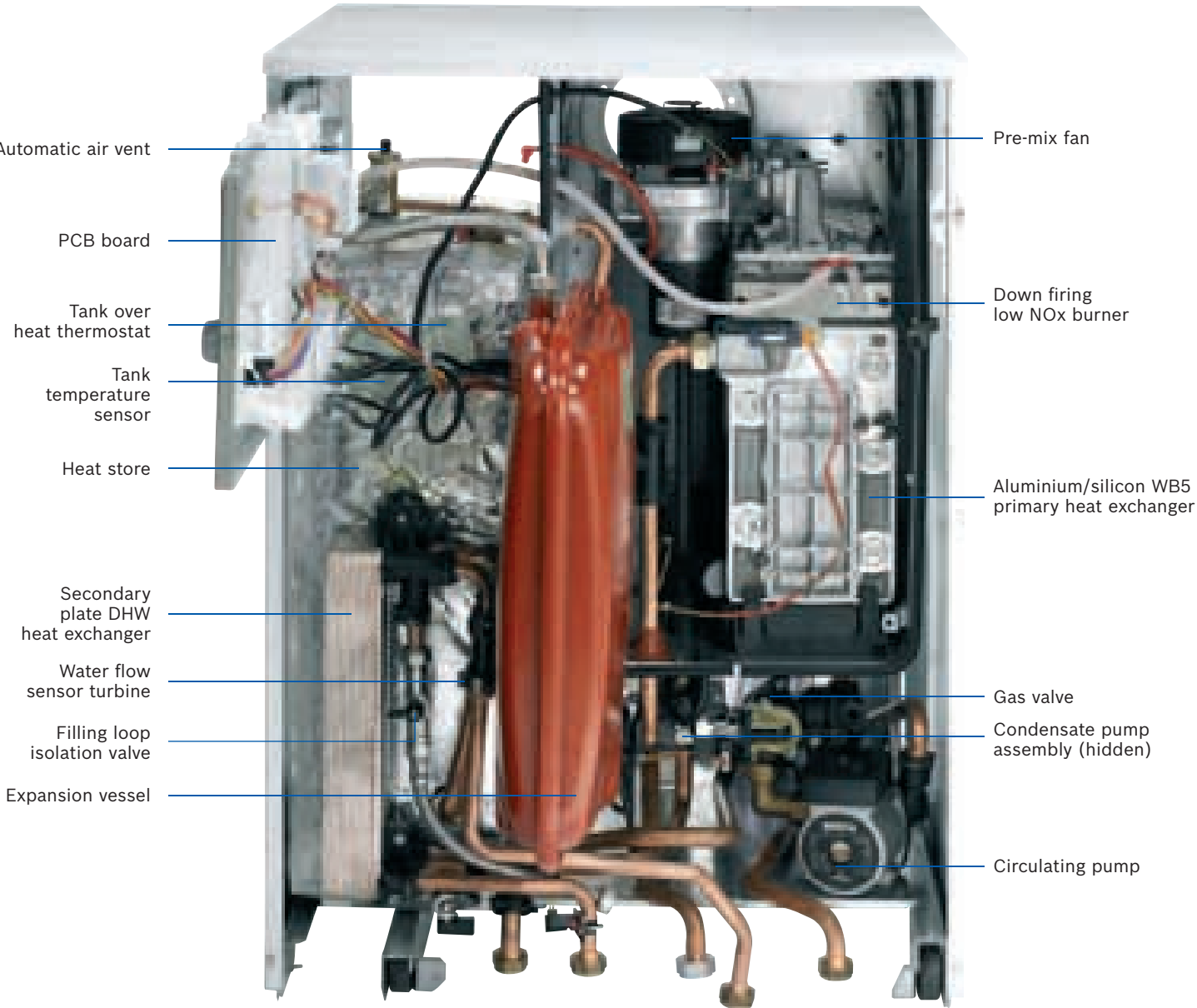
Backed by Worcester quality

Every Greenstar Highflow CDi boiler is operationally tested before it leaves the factory as part of Worcester's rigorous quality control procedure. When you install a Worcester boiler, you can rest assured that your customer is receiving the best quality components and highest levels of workmanship.



The Greenstar Highflow CDi fascia accommodates a wide range of Worcester controls.

Inside story –Greenstar Highflow CDi condensing combi boiler series



Technical data

| Boiler | Greenstar Highflow 440CDi | Greenstar Highflow 550CDi |
|--|---------------------------|---------------------------|
| Height | 850mm | 850mm |
| Width | 600mm | 600mm |
| Depth | 600mm* | 600mm* |
| Weight – dry | 112kg | 112kg |
| 2005 SEDBUK value – natural gas | 90.8% / A rated | 91% / A rated |
| 2005 SEDBUK value – LPG | 92.2% / A rated | 92.2% / A rated |
| 2009 SEDBUK value – natural gas | 89.2% | 89.2% |
| 2009 SEDBUK value – LPG | 90.2% | 90.2% |
| Heating flow / return connections | 22mm compression | 22mm compression |
| Hot / cold water connections | 22mm compression | 22mm compression |
| Pressure relief valve | 15mm dia. | 15mm dia. |
| Condensate connection | 22mm plastic pipe | 22mm plastic pipe |
| Gas connection | 22mm compression | 22mm compression |
| Primary water content | 51 litres | 51 litres |
| Minimum domestic inlet pressure for max. DHW flow rate | 1.5bar | 1.7bar |
| Minimum domestic inlet pressure to operate the appliance | 0.5bar | 0.5bar |
| Maximum domestic inlet pressure | 10bar | 10bar |
| DHW flow rate @ 35°CΔT | 20 l/min | 25 l/min |
| Output to central heating | 7.4 - 29.2kW | 9.7 - 30.6kW |
| Floor mounted pre-plumbing jig | ✓ | ✓ |
| Filling link | ✓ | ✓ |
| Plug-in timer | ✓ (optional) | ✓ (optional) |
| Condensate disposal pump | ✓ | ✓ |
| Fault diagnostic display | Digital | Digital |
| Max. vertical flue (100mm dia.) inc. terminal | 6,400mm | 6,400mm |
| Max. vertical flue (125mm dia.) inc. terminal | 15,000mm | 15,000mm |
| Max. horizontal flue (100mm dia.) | 4,000mm | 4,000mm |
| Max. horizontal flue (125mm dia.) | 13,000mm | 13,000mm |
| NOx classification – natural gas | 33.3mg/kWh | 32.2mg/kWh |
| NOx class | 5 | 5 |

*630mm to front of flap.

Controls

5 year guarantee

When purchased and installed at the same time, the guarantee period for a Worcester control will match that of a Greenstar gas-fired boiler*.



Advanced intelligent controls

FW100 – Weather compensation controller – Part no. 7 716 192 067

- Boiler output automatically adjusts to precisely meet the heat demands of the property according to outside temperature conditions at maximum efficiency
- Programmable unit with six switching points a day for control of both central heating and hot water pre-heat
- Choice of six selectable weekly programmes
- Can be integral to the boiler or wall-mounted
- Has factory-set heatcurves for various different heating systems (radiators, underfloor etc.)
- Manual-override that can boost or reduce heating if required.

FR110 – Programmable room thermostat – Part no. 7 716 192 066

- Intelligent programmable room thermostat
- Load compensation
- Choice of six selectable weekly programmes
- Six switching points a day for central heating and hot water pre-heat
- Boiler output automatically adjusted to precisely meet the heat demand of the property at maximum efficiency
- Maximises the condensing boiler's operation.

FR10 – Intelligent room thermostat – Part no. 7 716 192 065

- Load compensation
- Boiler output automatically adjusted to precisely meet the heat demand of the property at maximum efficiency
- Maximises the condensing boiler's operation
- For use with a 230V programmer. Not compatible with Worcester Comfort controls.

NEW Greenstar Comfort controls

Comfort plug-in twin channel programmer – Part no. 7 733 600 003

- Simple menu navigation
- 7-day time control for heating and hot water
- Heating programme visualisation bar.

Comfort I RF wireless room thermostat and plug-in twin channel programmer – Part no. 7 733 600 001

- All the features of Comfort **PLUS**...
- Enhanced load compensation for increased efficiency
- No wiring required
- Extremely reliable RF signal.

Comfort II RF wireless programmable room thermostat and plug-in RF receiver – Part no. 7 733 600 002

- All the features of Comfort and Comfort I **PLUS**...
- 6 adjustable heating temperatures per day
- Set programme at the room thermostat
- Remote access to boiler diagnostic codes
- Back lit display.

Mechanical timers

MT10 mechanical timer (for use with all models) – Part no. 7 716 192 036

- The simplest Worcester device
- Analogue clock for setting on and off times for heating
- No control over hot water times.

MT10RF mechanical timer (for use with all models) – Part no. 7 716 192 037

- Simple installation
- Analogue display has comfort and economy time and temperature periods
- No control over hot water times
- No need for separate room thermostat
- No wiring

Controls at a glance

| Control option | TYPE | | | | MOUNT | | TIME CONTROL | | | | | TEMPERATURE CONTROL | | | | CONNECTION TYPE | | |
|----------------|------------|---------|-------------|----------|----------------|--------------|-----------------|-----------|---------|-------|-----------------------|---------------------|------------------------------|---------------|-------------------------------|-----------------|-----------------|------------|
| | Mechanical | Digital | Intelligent | Internet | Fascia mounted | Wall mounted | Central heating | Hot water | 24 hour | 7 day | Auto switch – BST/GMT | Room thermostat | Programmable room thermostat | Optimum start | Boiler flow temp compensation | Plug-in | Radio frequency | Hard wired |
| MT10 | ✓ | | | | ✓ | | ✓ | | ✓ | | | | | | | ✓ | | |
| MT10RF | ✓ | | | | | ✓ | ✓ | | ✓ | | | | ✓ | | | | ✓ | |
| Comfort | | ✓ | | | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | | | ✓ | | |
| Comfort I RF | | | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | | ✓ | | ✓ | |
| Comfort II RF | | | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | | ✓ | | ✓ | |
| FR10 | | | ✓ | | | ✓ | | | | | | ✓ | | | ✓ | | | ✓ |
| FR110 | | | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | | | ✓ |
| FW100 | | | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | | ✓ | ✓ | | ✓ |
| Wave | | | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | | | ✓ |

Worcester Wave – smart control for heating and hot water

The Wave is the first of a new generation of Worcester controls.

The Wave is a smart, internet-connected programmable control for central heating and hot water which can be operated using a smart device.

The Wave's innovative programming enables it to have an 'intelligent conversation' with the boiler and take advantage of advanced control features such as weather and load compensation.

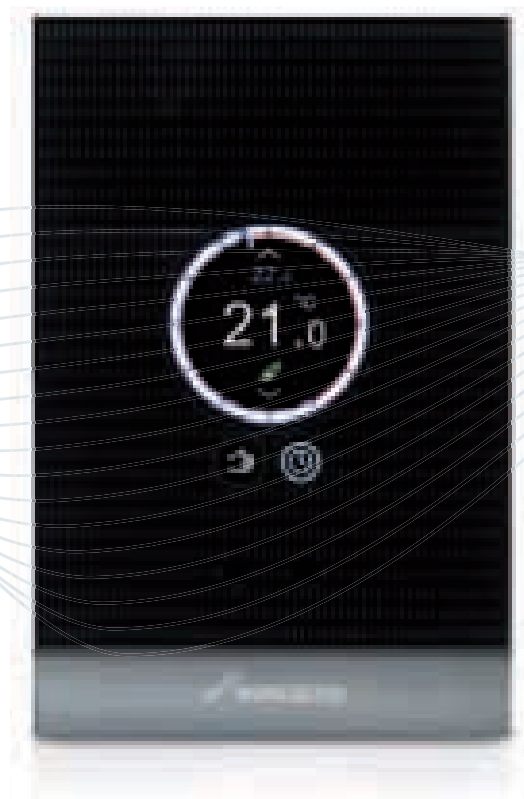
Enhanced energy efficiency

In the forthcoming ErP Directive (Energy-related Products Directive) coming out of Europe, smart controls like the Wave are recognised as improving the system efficiency by at least 4%, resulting in lower fuel bills.

The Wave's energy efficiency features include:

- Charts of heating and hot water usage so the homeowner can easily identify where potential savings could be made.
- When the room temperature is turned down a leaf symbol will appear to indicate additional savings are being made.

| Features | Benefits |
|---|---|
| Only a low voltage 2-core wire connection between the controller and the boiler | Easy to install, all other connections are via the Wi-Fi network |
| Remote control of heating AND hot water via app | Programme the heating system from outside the home |
| Load and weather compensation via the internet (no outdoor sensor required) | Allows the boiler to modulate its performance to meet the needs of each household |
| Intuitive and modern design | Ensures easy programming and control of the boiler, resulting in a simple hand over with the end-user |
| Energy graphs, presence detection and many more features come as standard | Ensures increased comfort and energy savings |
| No subscription fees or chargeable app add-ons | One-off cost |



Adapting to the homeowner's needs

Each Wave unit is supplied with a pre-set programme that can then be easily modified to suit the user's requirements.

The Wave's advanced user features include:

- 'Pairing' with up to eight devices, automatically sensing when people are at home.
- Sensing to an individual device can be turned off if required.
- The Wave will remember preferred programme settings to make these easily available and features a 'holiday programme', requiring just a start and finish date.
- Unlike most other smart heating controls, the Wave can also programme the hot water settings, providing additional energy savings and comfort.
- For security and peace of mind, all of the Wave's data is owned by the user, ensuring no information is shared with other parties.

Wave compatible devices:*

Apple® devices running iOS 5.1 and higher

Android™ devices running 2.2, 2.3 or 4.0 and higher



Quick to install

The Wave is quick and easy to install:

- Only requires a 2-core wire connection between the control and the boiler.
- All other connections are via the Wi-Fi network.
- The Wave does not need an external wired sensor unlike standard weather compensation controls.
- The Wave uses online data which significantly reduces installation time and cost to the end user.

As with all room heating controls the Wave should be sited where it can monitor the overall temperature of the property.



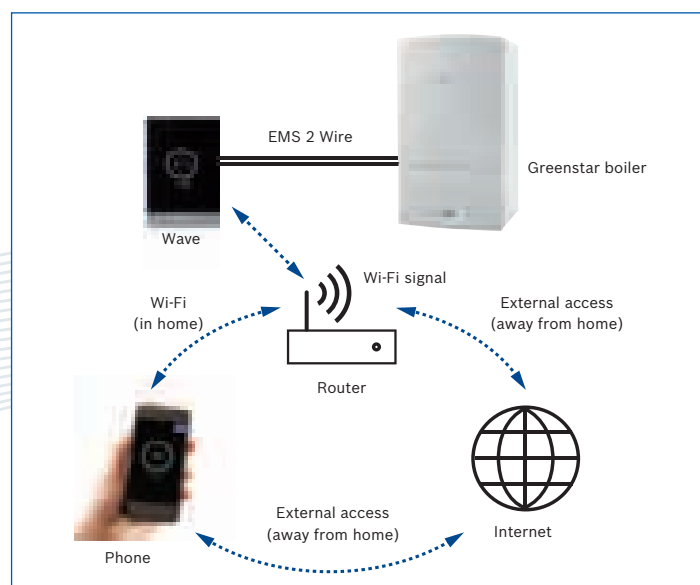
Compatibility with Worcester Greenstar boilers

Ideal for homes and small businesses, the Wave is compatible with all current Worcester Greenstar gas-fired combination and system* boilers. It can also be retrofitted for use with previous Worcester EMS-bus appliances.

All you need is:

- Worcester Wave control
- Worcester compatible boiler*
- Wi-Fi enabled broadband router – 802.11 b/g
- Wave app on a compatible Apple® or Android™ device.

| Part number | Description |
|---------------|-------------|
| 7 716 192 072 | Wave |



Simple to use, providing an easy handover

The Wave's intuitive and modern design ensures it is very simple to operate using either its in-built touchscreen or via the Wave app.

- Users simply download the Wave app to their compatible device to take control of their heating system from anywhere in the world where an internet connection is available.
- There are no subscription fees or chargeable app add-ons, therefore updates to the app software are completely free of charge.
- An installation and operating manual is provided with each control and there are a number of helpful videos to provide further detail on specific functions.
- Should the Wave temporarily lose the internet connection, it will continue to operate as an intelligent heating and hot water control simply by using the last saved programme settings.



Site preparations and guidance

All combi boilers require less installation time than a conventional boiler, for these reasons:

- Zero pressure governor gas valve with fully modulating fan
- Highly versatile multi-directional fluing system
- Combined ignition and control board means less connections
- Supplied with built-in filling link
- Optional plug-in timers
- Built-in boiler frost protection
- Supplied with roll-on bracket and floor mounted installation frame.

Siting of appliance

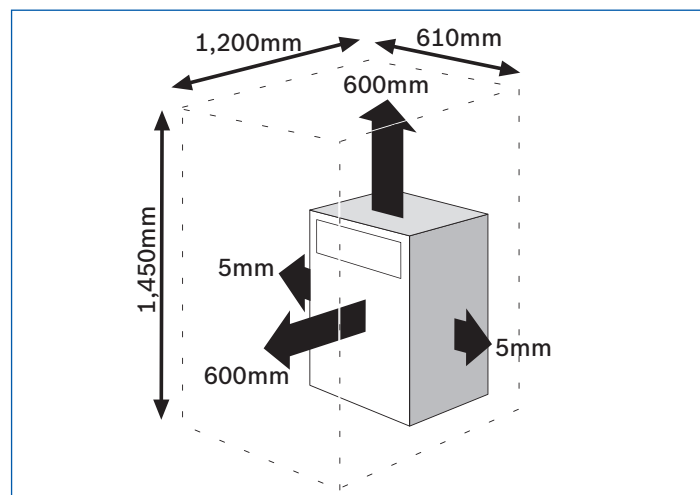
The appliances are only to be installed internally within a property, at a suitable location onto a fixed, rigid surface, that is at least the same size as the appliance and is capable of supporting its weight.

Mounting on a combustible surface

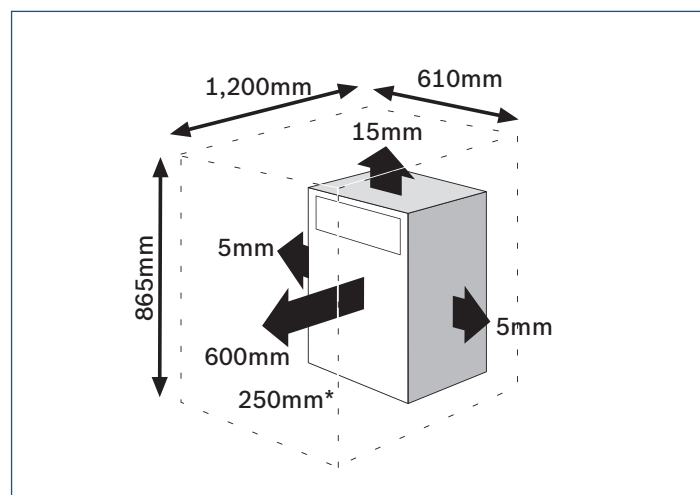
The appliances may be installed into an airing cupboard if required. Use a non-combustible perforated material (max. hole sizes of 13mm) to separate the boiler from the airing space. See section “Boiler location” on page 15.

Installation and service clearances

The minimum clearances shown below should be allowed for installation and servicing. Compartment ventilation would only be required at these clearances.



Installation clearances for Greenstar Highflow CDi



Service clearances for Greenstar Highflow CDi

**Space required for unvented areas with a removable door or panel*

Compartment installation

Compartments: Follow the requirements of BS 6798 and BS 5440 Part 2 and note:

- Minimum clearances must be maintained
- An access door is required to install, service and maintain the boiler and any ancillary equipment
- If fitting the boiler into an airing cupboard use a non-combustible perforated material (maximum hole sizes of 13mm) to separate the boiler from the airing space.

Boiler location

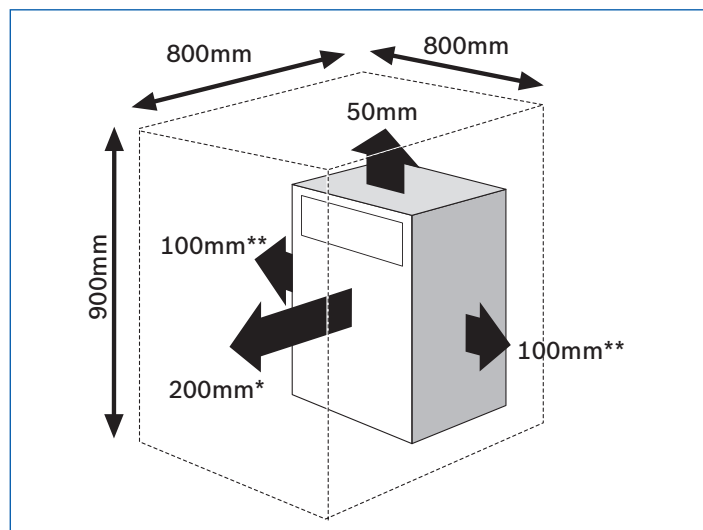
The appliance may be installed in any room, although particular attention is drawn to the requirements of the IEE regulations applicable, and in Scotland the electrical provisions with respect to installation in a room containing a bath or shower.

1. The room in which the appliance is installed does not require a dedicated air vent.
2. If the appliance is installed in a cupboard or compartment with dimensions that allow the following minimum clearances, then no ventilation is required:

| Compartment installation | |
|--------------------------|--|
| Position of appliance | Minimum unventilated clearance (to removable door) |
| In front | 75mm* |
| Right side | 100mm |
| Left side | 100mm |
| Above flue elbow/casing | 50mm |

*75mm from an opening door. 600mm is required for servicing

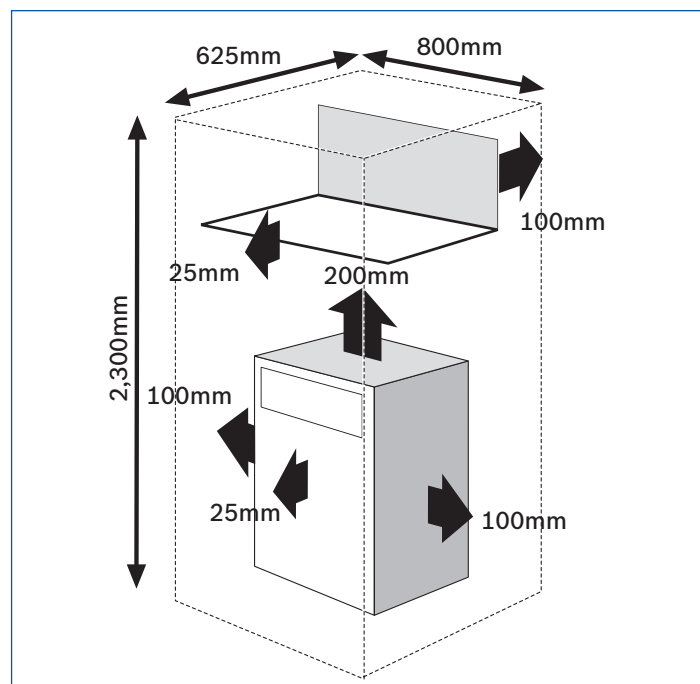
Ventilation-free compartment installation – minimum clearances



*Space required for unvented areas with a removable door or panel.

**This space can be reduced to 50mm for one side only as long as both the side clearances add up to the total of both the side measurements shown or more.

Airing cupboard clearances – minimum clearances



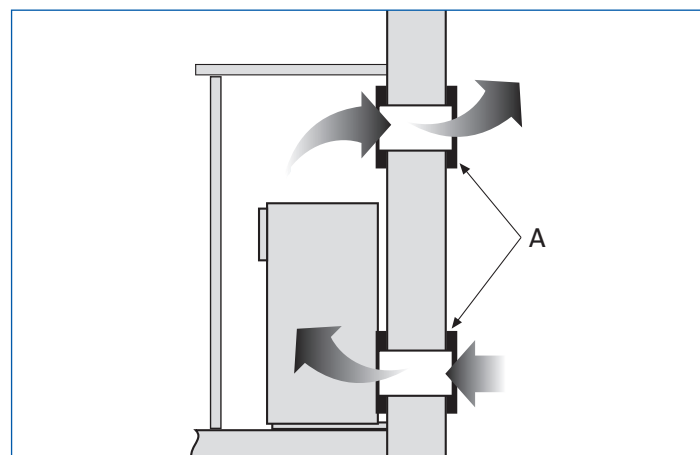
Venting compartments

If the clearances are less than those stated for the options above then ventilation must be provided as described in BS 5440.

A minimum of 2 air vents (A) must be fitted, one at low level and another at high level onto the same wall using the same air for circulation, see diagram below.

Minimum free air required for venting:

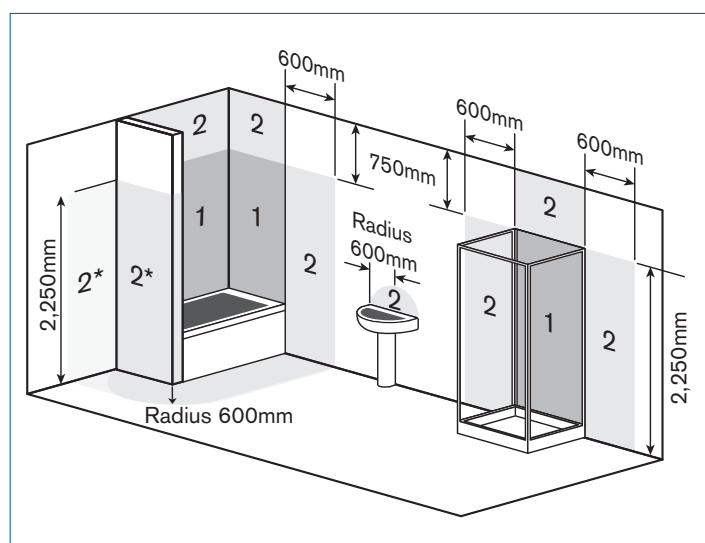
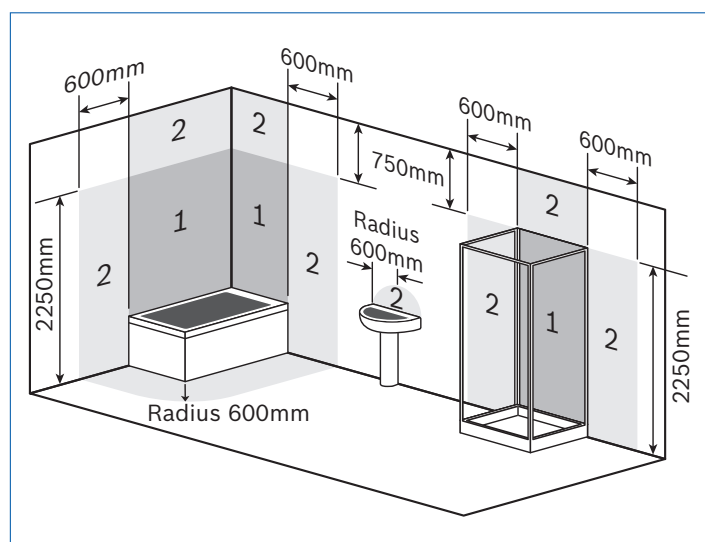
- For air directly from outside:
Greenstar Highflow 440CDi 155cm² per vent
Greenstar Highflow 550CDi 220cm² per vent
- For air from internal space/room:
Greenstar Highflow 440CDi 310cm² per vent
Greenstar Highflow 550CDi 440cm² per vent



Important: bathroom locations and clearances

- The boiler must not be installed in Zone 1
- Any switch or appliance control using mains electricity must not be within reach of a person using the bath or shower
- Electrical switches (other than pull cords), fused spurs and socket outlets must not be situated in the bathroom
- A boiler fitted with a mechanical timer or RF mechanical timer (receiver) or FW100 controller may only be installed outside the shaded area. A boiler with any other timer fitted (or blanking panel for an optional programmer) can be installed in zone 2.
- Additional Residual Current Device (RCD) protection may be required.

Refer to the latest IEE wiring regulations.

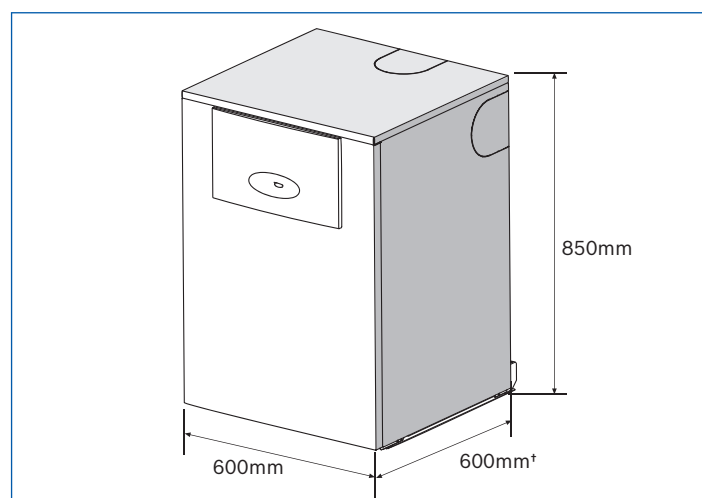


Site preparation/portability

Greenstar Highflow CDi appliances are supplied with a floor mounted pre-plumbing jig. The jig enables all gas and water services to be pre-plumbed and tested prior to fitting the boiler.

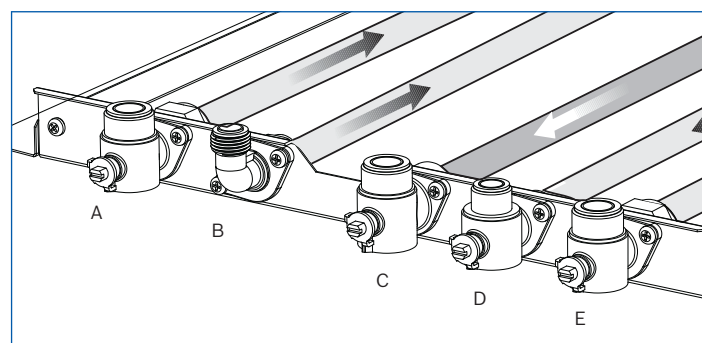
For ease of installation the appliance has a roll-in boiler tray which allows it to be rolled into place once the connections have been made.

Casing dimensions



*630mm to front of flap.

Pipework connections



| Pipework connections | | |
|----------------------|------------------------|------|
| A | Central heating flow | 22mm |
| B | DHW flow | 22mm |
| C | Gas inlet | 22mm |
| D | Cold main inlet | 22mm |
| E | Central heating return | 22mm |

Installation requirements

Installation of Greenstar Highflow CDi combi boilers must be in accordance with the relevant requirements of the Gas Safety (Installation Use) Regulations at the time of installation, current IEE Wiring Regulations, local Building Regulations, Building Standards (Scotland) regulations and bylaws of the local Water company and Health and Safety Document No. 635 (Electricity at Work Regulations 1989). It should be in accordance with the relevant recommendations of the following British Standards:

BS 6798; BS 5449; BS 5546:1; BS 5440:1; BS 5440:2; BS 6891.

Gas Safety (Installation and Use) Regulations. All gas appliances must be installed by a Gas Safe registered person in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution.

The manufacturers notes must not be taken in any way as overriding statutory regulations.

Sealed primary systems

Worcester Greenstar Highflow CDi combi boilers are supplied complete with all the necessary components to form a sealed primary system. Included are a pre-plumbed expansion vessel (12 litres), a pressure relief valve (set at 3bar), an automatic air vent and a pressure gauge.

The expansion vessel fitted to the appliance will accommodate differing system volumes, depending upon its initial charge pressure, and system pre-pressurisation. The table below shows the system volume that can be accommodated under different conditions. If it is found that the system volume exceeds that catered for by the expansion vessel fitted within the appliance, then an extra vessel should be added as close to the appliance as possible in the heating return pipe. Refer to BS 5449:1 and BS 6798:1 for further information.

| Total system volume – litres (gallons) | | | |
|--|-------------------------------|------------|-----------|
| Initial system pressure (bar) | Initial charge pressure (bar) | | |
| | 0.5 | 1.0 | 1.5 |
| 0.5 | 130 (29) | – | – |
| 1.0 | 80 (17.5) | 102 (22.5) | – |
| 1.5 | 43 (9.5) | 58 (13) | 71 (15.5) |
| 2.0 | 20 (4.5) | 27 (5.9) | 33 (7.5) |

System filling and make-up

To comply with the Water Authority requirements, the system should be filled via a temporary hose connection to the mains cold water supply, with a double check valve assembly and a test point fitted to the mains water side of the temporary circuit. This is supplied within the boiler.

Valves and joints

It is very important that all valves and joints are able to sustain a working pressure of up to 3bar (45psi). Particular care should be exercised when fitting radiator valves and only those of high quality to BS 2767:10 should be used. All other valves and fittings should comply with BS 1010.

Loss of water pressure from a sealed system will require continuous recharging with fresh water and consequential introduction of air. Air is highly corrosive and will considerably reduce life expectancy of radiators, pumps etc.

Plastic pipework

The use of plastic pipework is acceptable. However, some plastics are permeable to oxygen and must be avoided. Only pipework with a polymeric barrier should be used. Please note that the first 600mm of pipework connected to the boiler must be copper.

Open vented primary systems

It is not permissible to install a Greenstar Highflow CDi combi on an open vent system.

Natural gas supply

Appliances, when on a full output demand, will require up to 3.1m³/hr of gas for the 440CDi and 4.4m³/hr of gas for the 550CDi. The gas meter and supply pipes must be capable of supplying this quantity of gas in addition to the demand from any other appliance being served. It is important that a gas supply pipe of at least 22mm diameter is used. Under no circumstances should the size of the gas supply pipe be less than that of the appliance inlet connection. The meter outlet should be capable of ensuring a nominal pressure of 20mbar (8in wg) at the appliance. Particular consideration should be given to the resistance to gas flow created by elbows, bends etc. Pipework should be sized to overcome this resistance, details of this are given in the table below.

| | Total length of gas supply pipe (m) | | | Pipe diameter (mm) |
|--------------------------------------|-------------------------------------|------|-----|--------------------|
| | 3 | 6 | 9 | |
| Gas discharge rate m ³ /h | 2.9 | – | – | 15 |
| | 8.7 | 5.8 | 4.6 | 22 |
| | 18.0 | 12.0 | 9.4 | 28 |

Approximate additional length to be allowed (natural gas)

| Elbows or tees | | 90° bends | |
|----------------|------|-----------|------|
| Metres | Feet | Metres | Feet |
| 0.50 | 2 | 0.3 | 1 |

Liquid Petroleum Gas (LPG) supply

The appliances, when on a hot water or full output demand, will require up to 2.3kg/hr of gas for the 440CDi and 3.2kg/hr of gas for the 550CDi. The gas tank or bottles must be capable of supplying this quantity of gas at a nominal pressure of 37mbar (14.8in wg) at the appliance. The table below shows the LPG discharge through varying lengths of pipe and the resistance to flow created by elbows, bends etc. Pipework should be sized so as to overcome this resistance.

| | Total length of gas supply pipe (m) | | | Pipe diameter (mm) |
|--------------------------------------|-------------------------------------|-----|-----|--------------------|
| | 3 | 6 | 9 | |
| Gas discharge rate m ³ /h | 8.0 | 5.2 | 4.2 | 22 |
| | 15.9 | 8.8 | 8.3 | 28 |

Approximate additional length to be allowed (LPG)

| Elbows or tees | | 90° bends | |
|----------------|------|-----------|------|
| Metres | Feet | Metres | Feet |
| 0.6 | 2 | 0.3 | 1 |

Electricity supply

A 3amp fused three pin plug and unswitched shuttered socket outlet (both complying with BS 1363) or preferably a double pole isolator with a contact separation of 3mm in all poles supplying the appliance should be used.

The appliance electrical circuits are also protected by an internal 2.5amp fuse. The appliance must be earthed.

Mains cold water supply

Water Authority requirement

A direct mains cold water connection is permitted by Water Authorities, however, it is recommended that reference be made to local requirements. In the event of difficulty contact the Worcester Technical Support Department.

Pipe sizing

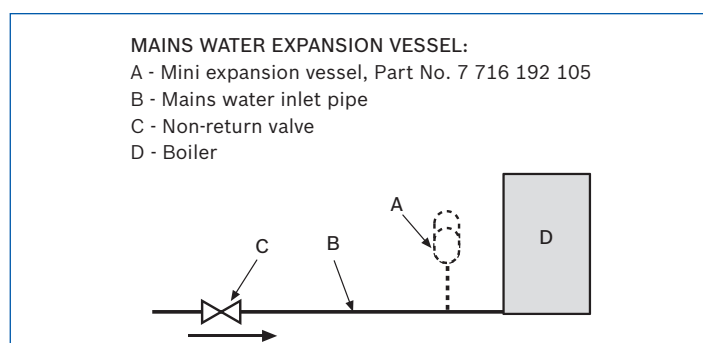
Unless the mains pressure is low, a standard 22mm diameter service pipe is normally suitable. A 22mm hot water distribution pipe to the first branch is recommended thereafter 15mm and/or 10mm to all draw off points.

Cold water connection

Wherever possible the cold supply to the appliance should be the first connection off the mains supply, in order to minimise hot water flow reduction when cold water services are operated. The final 600mm of piping to the appliance should be of copper only.

Cold water pressure

To achieve the stipulated flow rates of 20l/min (4.4gpm)/ 25l/min (5.5gpm) a working cold water mains pressure of 1.5bar/1.7bar is required. The appliance will operate at a minimum working pressure of only 0.5bar (7.5psi), however a reduced hot water flow rate should be expected. Back-flow prevention devices, including water meters, can prevent the expansion of hot water into the cold water main. However, this can result in a pressure build-up that may cause damage to the boiler and household devices such as showers, washing machines etc. In these cases we recommend that a mini-expansion vessel (Part No. 7 716 192 105) be fitted adjacent to the boiler in the cold water main.



Hot water supply

As with all mains fed systems, the flow rate of water obtainable from individual taps will vary in relation to the number of taps operating simultaneously, and will depend upon the cold mains supply available to the property.

Therefore, in order to avoid excessive starvation of flow to individual taps, flow balancing may be required by the use of proprietary constant volume flow regulators or Ball-o-Fix valves.

Hot water systems

Taps and valves

Hot and cold taps and mixing valves used with Greenstar Highflow CDi appliances must be suitable for operating at a mains pressure of up to 10bar (150psi) and temperatures of 65°C (150°F).

Showers

When a loose head shower with a flexible hose is used over a bath or shower tray, the hose must be fixed so that the head cannot fall closer than 25mm (1in) above the top edge of the spill over level of the relevant bath or shower tray. Alternatively, the feed pipes to the shower should incorporate a double check valve assembly or a check valve and vacuum breaker.

With fixed head showers no provision is necessary.

The use of a thermostatically controlled shower will give added comfort and safeguard against high hot water temperatures.

Bidet

The supply of hot and cold water mains direct to a bidet is permitted provided that the bidet is of the overrim water feed type. The outlet(s) should be shrouded and not have any temporary hand held spray attached. No other anti-siphonage arrangements are necessary.

Use in hard water areas

As the maximum temperature of the domestic hot water heat exchanger is limited by the electronic control circuit, there is normally no need for water treatment to prevent scale accumulation.

In areas where exceptional water conditions prevail, consideration may need to be given to the fitting of a device capable of preventing scale. In such circumstances the advice of the local water authority should be sought.

Guarantee

Worcester Greenstar combi appliances are offered with a full 5 year guarantee* on parts and labour and a 10 year guarantee* on the primary heat exchanger*. Ongoing service and maintenance contracts can be arranged through the Worcester Customer Service Department.

Please contact our guarantee registration advisors on 0330 123 2552 or visit www.worcester-bosch.co.uk/guarantee



On all Greenstar combi appliances*



On the primary heat exchanger*

The Worcester Greenstar System Filter

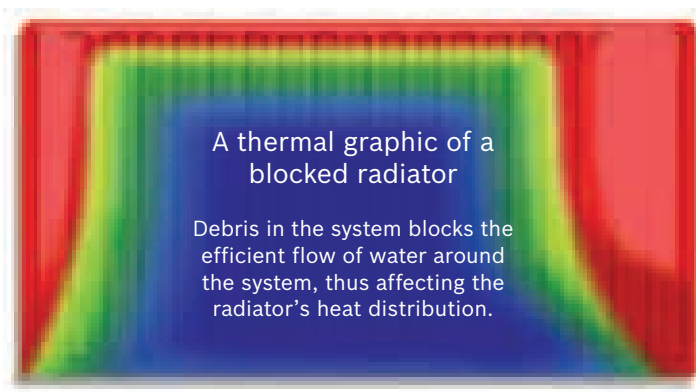
Modern condensing boilers are precision-engineered and designed to run with a clean water heating system. Over time, dirty system water will damage a boiler and its components, causing failures and shortening the life of the overall system.

Damaged boiler and system components

- Blockages in primary heat exchanger
- Increased wear on pumps
- Blocked valves.

Reduced efficiency

- Energy efficiency loss equivalent to a boiler being reduced from A rated efficiency to D rated, resulting in fuel wastage
- Blocked radiators can reduce efficiency and heating comfort.



A highly effective solution from the brand you can trust

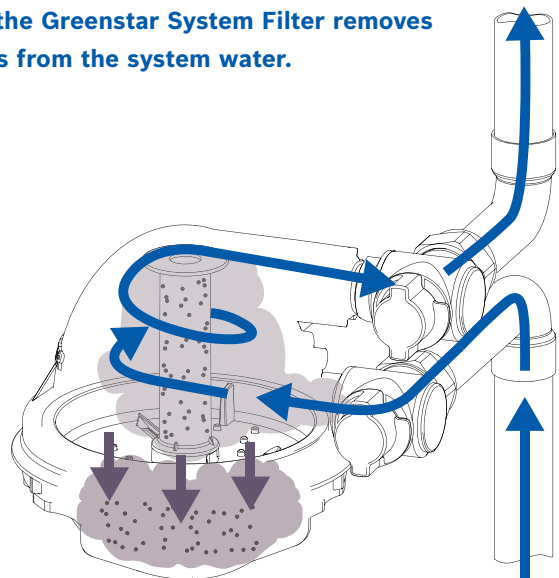
The Worcester Greenstar System Filter has been specifically designed to combat the damaging effects of system debris and pollutants, allowing homeowners to protect their boiler or heat pump for a fraction of its cost. The filter is suitable for 22mm piped heating systems.

At the centre of this innovative design is a highly powerful magnet that removes the magnetic debris (magnetite) that is present in the heating system water. The central location of the magnet ensures that magnetite is collected quickly and retained, maximising the overall protection. Any non-magnetic debris is caught by the twin-action cyclonic trap, a proven technology that offers a capacity to collect up to 200g of magnetite a year.



The Greenstar System Filter has been extensively tested in simulated systems, proving its effectiveness in removing iron oxide, magnetite, limescale particles, casting sand, welding debris, non-magnetic metal flakes, paint particles and other system pollutants.

How the Greenstar System Filter removes debris from the system water.



Installation

The filter can be installed almost anywhere in a heating system, however to maximise the effectiveness, it should be placed before the boiler and after the last radiator on the return pipework.



| Features | Benefits |
|--|--|
| Highly effective filter | Safeguards the boiler against damage and protects the efficiency of the system. Saves up to 6% a year on energy bills* |
| Prevent blockages in radiators | A warmer home and quieter system |
| High powered internal magnet | Proven technology that can capture up to 200g of magnetite |
| Cylindrical design | Increased performance – better installation options |
| Twin-action – magnetic and non-magnetic filtration | Instantly effective against a wide range of system debris |
| No power consumption or moving parts | No electrical wiring connection or supply needed. Zero running costs and no failure of components |
| Can be installed under the boiler or away from the appliance | Flexibility |
| One-way valve for adding system chemicals | Removes the need to isolate a section of the system when carrying out servicing and maintenance |
| Worcester, Bosch Group specification and design | Reliability of components and filter |

**Independent research carried out by GASTEC at CRE*

| Product info | |
|--------------|---------------|
| Part number | 7 716 192 609 |

Condensate pipework

All condensing boilers generate condensate discharge which needs to be piped away from the appliance using a plastic pipe.

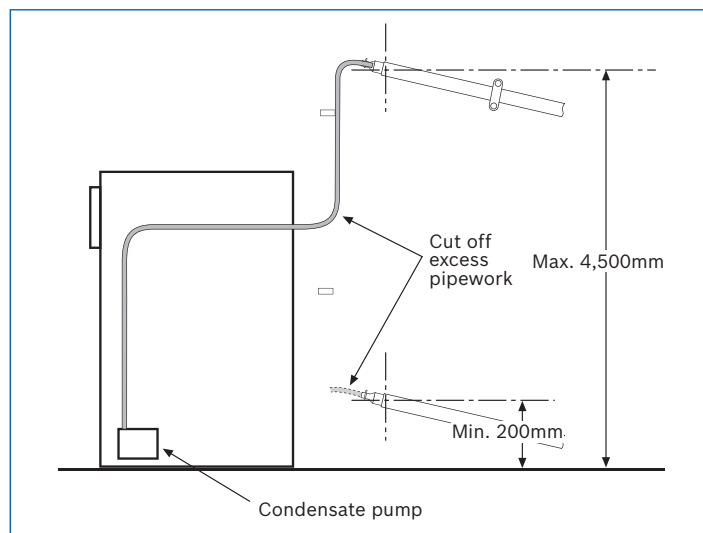
The amount of condensate generated depends on the efficiency and operating status of the appliance. Depending on operating temperatures, the appliance will condense in both heating and hot water modes and may generate up to 2.7 litres of condensate per hour for the 440CDi and 3.7 litres per hour for the 550CDi Regular.

Condensate termination and route

Greenstar Highflow CDi combi boilers incorporate a condensate pump which allows condensate to be plumbed above the boiler, allowing more flexible siting possibilities.

Condensate connection

The condensate pump fills up and periodically discharges through the flexible condensate pipe between 200mm and 4,500mm from floor level. After this point the condensate continues down the 22mm rigid pipework to the outlet using gravity.



- The flexible plastic pipe can be reduced in length to suit the installation circumstances. The pipework must follow one of the options shown opposite.

Never terminate or discharge into any open source, including: sink, bath, shower, bidet, toilet etc.

Note: any external condensate pipework should be protected with weather resistant insulation to help prevent freezing.

The condensate connection on Worcester appliances is in 22mm polypropylene. The pipe should be extended and run away from the appliance with a constant fall of 3° or at least 50mm in every metre away from the boiler.

The condensate pipe can terminate into any one of four areas.

Whilst all of the methods are acceptable it is best practise to terminate the condensate pipe via an internal waste system. This will eliminate the need for any external condensate pipe runs which can be susceptible to freezing in extreme weather. Best practise is not to run external condensate pipe any further than 3m. If it is necessary to run more than 3m externally increase pipe size to 32mm.

Condensate termination and route

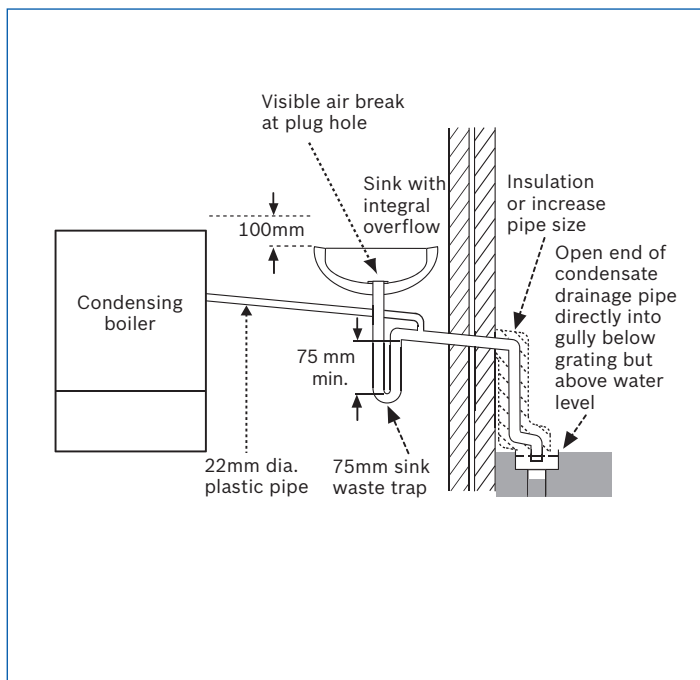
External condensate pipework

The Worcester Greenstar Highflow CDi combi appliances have a condensate pump rather than a siphonic condensate trap. Rather than the condensate constantly dripping into the discharge pipe, the condensate is collected in the pump which releases it in 100ml quantities. This will help prevent freezing occurring.

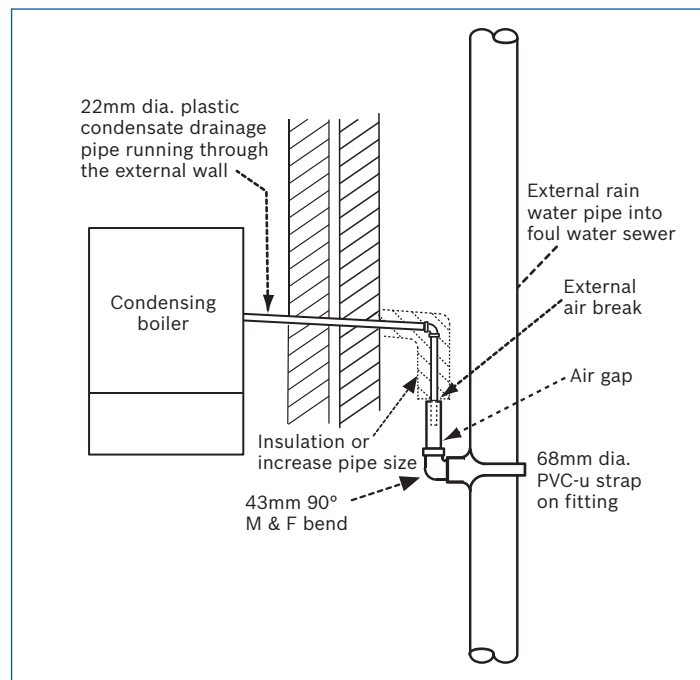
Wherever possible the condensate discharge pipework should be routed and terminated internally. Should this not be possible, and the only available route is external, the following conditions should be observed:

- The pipework length should be kept to a minimum and the route as vertical as possible
- Where pipework could be subjected to extreme cold or wind chill, a weather proof insulation should be used. **Alternatively, the condensate pipework could be increased to a minimum 32mm.**

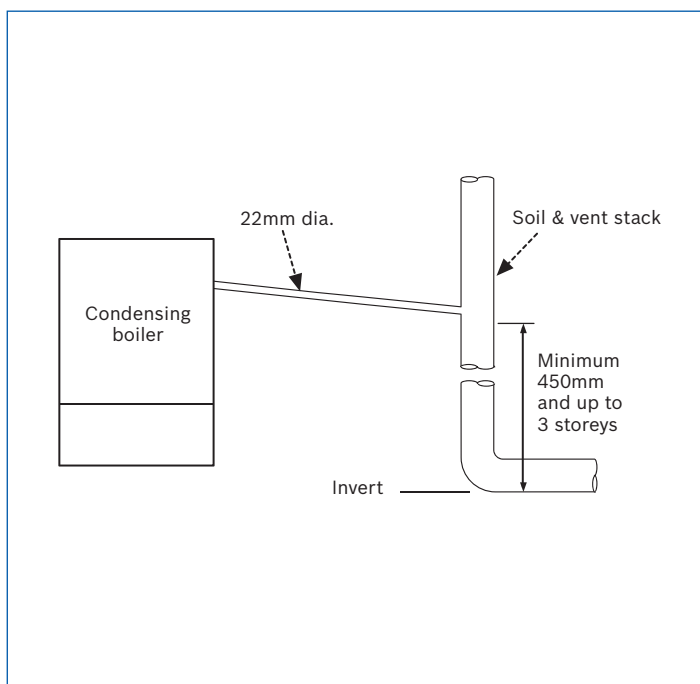
For full technical information on pipe size, insulation and different condensate pipework methods, please see Installation, Commissioning and Servicing Instruction Manual.



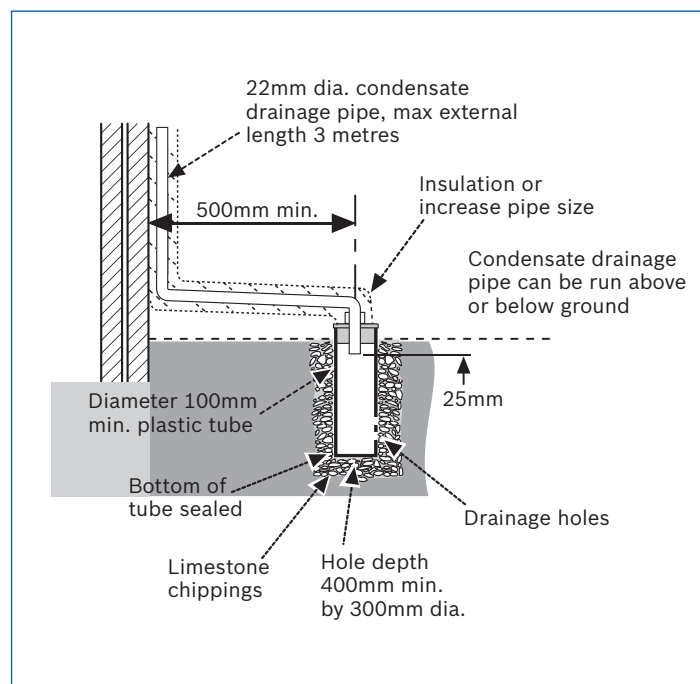
Internal sink/washing machine drain



External air break when using a foul water down pipe



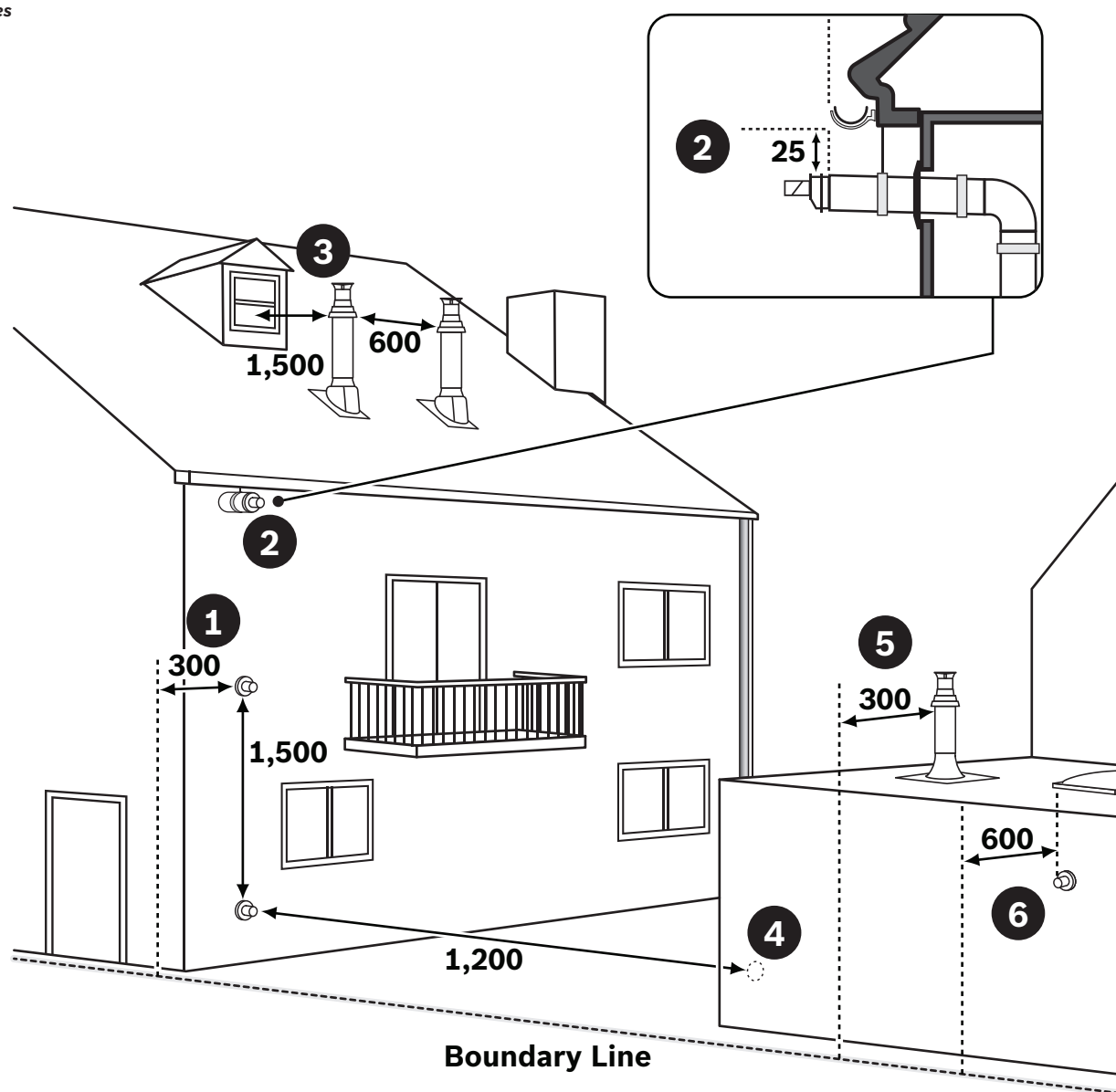
Soil and vent stack



External condensate absorption point (unsuitable for clay soil types)

Horizontal and vertical flue terminal positioning

All measurements in millimetres



Note

- All measurements are the minimum clearances required
- Terminals must be positioned so as to avoid combustion products entering the building
- Support the flue at approximately one metre intervals and at a change of direction, use suitable brackets and fittings.

Flue bracket part numbers:

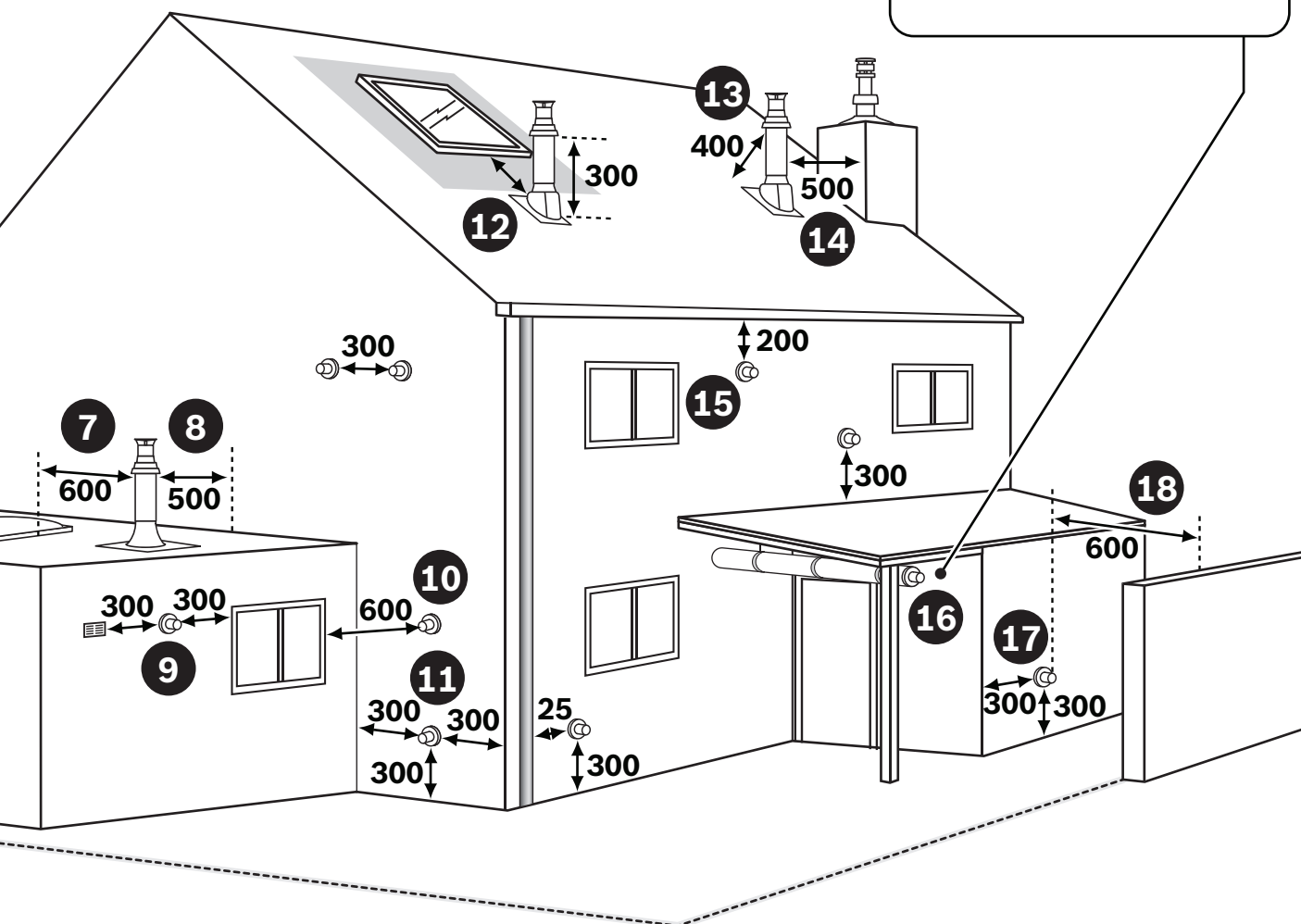
7 716 191 092 (100mm dia.)

7 716 191 173 (100mm dia. x 6)

7 716 191 174 (125mm dia.)

Key to illustration

1. 300mm adjacent to a boundary line.
2. The dimension below eaves, balconies and car ports can be reduced to 25mm, as long as the flue terminal is extended to clear any overhang. External flue joints must be sealed with suitable silicon sealant.
3. 1,500mm between a vertical flue terminal and a window or dormer window.
4. 1,200mm between terminals facing each other.
5. Vertical flue clearance, 300mm adjacent to a boundary line.
6. 600mm distance to a boundary line, unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines.
7. 600mm minimum clearance from a skylight to a vertical flue.
8. Vertical flue clearance, 500mm to non-combustible building material, and 1,500mm clearance to combustible building material.



- **Installations in car ports are not recommended**
- **The flue cannot be lower than 1,000mm from the top of a light well due to the build up of combustion products**
- **Dimensions from a flue terminal to a fanned air inlet to be determined by the ventilation equipment manufacturer.**

Greenstar Highflow CDi combi boiler horizontal fluing options

Greenstar Highflow CDi combis offer a choice of 2 different sized horizontal RSF flue systems, 100mm diameter and 125mm diameter. The systems have different maximum lengths. Options 1 to 8 detail the permissible lengths.

Horizontal RSF flue



| Flue diameter | 100mm | 125mm |
|---------------------|---------|----------|
| Minimum flue length | 130mm | 350mm |
| Maximum flue length | 4,000mm | 13,000mm |

100mm dia. telescopic flue kit

Comprises:

- 1 x internal flue connector bend
- 1 x flue adaptor
- 1 x flue connector
- 2 x wall cover plates
- 530mm (100mm dia.) of flue duct including terminal

Part No. 7 716 191 155

125mm dia. standard flue kit

- 1 x internal flue connector bend
- 1 x flue adaptor
- 1 x flue connector
- 2 x wall cover plates
- 965mm (125mm dia.) of flue duct including terminal

Part No. 7 716 191 157

Accessories

| Components | Part No. | Description |
|-----------------------|---------------|---|
| 100mm diameter | | |
| | 7 716 191 155 | Horizontal telescopic kit (530mm) |
| | 7 733 600 048 | High level horizontal telescopic flue kit |
| | 7 716 191 083 | Extension flue kit (960mm*) |
| | 7 716 191 172 | 2m flue extension |
| | 7 716 191 133 | Short flue extension (220mm*) |
| | 7 716 191 084 | 90° bend |
| | 7 716 191 085 | 45° bend |
| | 7 716 191 164 | Vertical flue adaptor |
| | 7 716 191 092 | Support bracket kit |
| | 7 716 191 173 | Support bracket kit (6 pack) |

| | | |
|-----------------------|---------------|-----------------------------|
| 125mm diameter | | |
| | 7 716 191 157 | Horizontal flue kit (965mm) |
| | 7 719 003 666 | Extension flue kit (960mm*) |
| | 7 719 003 664 | 90° bend |
| | 7 719 003 665 | 45° bend |
| | 7 716 191 165 | Vertical flue adaptor |
| | 7 716 191 174 | Support bracket kit |

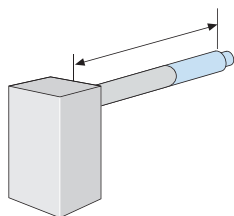
*Dimensions when fitted



**The 100mm flue system inclines 2° within the 100mm terminal.

The following criteria should be noted when planning the installation:

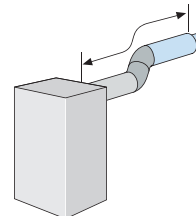
- The concentric flue system must be inclined at 3° (52mm per metre) from the appliance, to allow condensate to drain back into the boiler
- A white plume of condensation will be emitted from the terminal because the appliance operates at high efficiency. Care must be taken when selecting the flue terminal position
- To achieve a maximum flue length, one of the extension flue kits will need to be cut so that the permitted maximum flue length is not exceeded
- Horizontal flue options 1-8 illustrate common flue installations. Other configurations of the flue system are possible up to, and not exceeding, the stated maximum flue lengths.




Option 1: Extension rear flue horizontal flue assembly



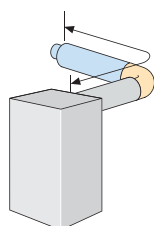
| Components | |  |  |
|---|--------|---|---|
| Part No. 100mm | | 7 716 191 155 | 7 716 191 083 |
| Part No. 125mm | | 7 716 191 157 | 7 719 003 666 |
| Maximum lengths (mm) & no. of components required | | | |
| Greenstar Highflow CDi series | | | |
| 100mm | 4,000 | 1 | up to 4 |
| 125mm | 13,000 | 1 | up to 12 |




Option 3: Extension rear flue horizontal using 45° bends



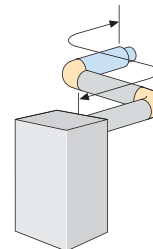
| Components | |  |  |  |
|---|--------|---|---|---|
| Part No. 100mm | | 7 716 191 155 | 7 716 191 083 | 7 716 191 085 |
| Part No. 125mm | | 7 716 191 157 | 7 719 003 666 | 7 719 003 665 |
| Maximum lengths (mm) & no. of components required | | | | |
| Greenstar Highflow CDi series | | | | |
| 100mm | 2,500 | 1 | up to 2 | 2 |
| 125mm | 11,000 | 1 | up to 10 | 2 |




Option 2: Extension rear flue horizontal using a 90° bend



| Components | |  |  |  |
|---|--------|---|---|---|
| Part No. 100mm | | 7 716 191 155 | 7 716 191 083 | 7 716 191 084 |
| Part No. 125mm | | 7 716 191 157 | 7 719 003 666 | 7 719 003 664 |
| Maximum lengths (mm) & no. of components required | | | | |
| Greenstar Highflow CDi series | | | | |
| 100mm | 2,500 | 1 | up to 2 | 1 |
| 125mm | 11,000 | 1 | up to 10 | 1 |

Option 4: Extension rear flue horizontal using a second 90° bend



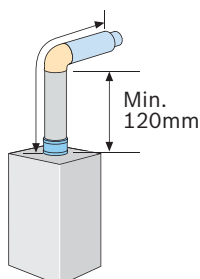
| Components | |  |  |  |
|---|-------|---|---|---|
| Part No. 100mm | | 7 716 191 155 | 7 716 191 083 | 7 716 191 084 |
| Part No. 125mm | | 7 716 191 157 | 7 719 003 666 | 7 719 003 664 |
| Maximum lengths (mm) & no. of components required | | | | |
| Greenstar Highflow CDi series | | | | |
| 100mm | 1,000 | 1 | up to 2 | 2 |
| 125mm | 9,000 | 1 | up to 8 | 2 |

Note: The short flue extension (100mm dia.) may be used as an alternative to the standard extension as required up to the maximum flue lengths stated (Part No. 7 716 191 133).

Note: The maximum flue length must be reduced by the following amounts for each bend used.

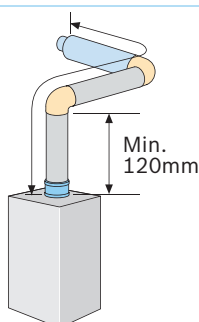
| | 45° bend | 90° bend |
|---------------------------------------|----------|----------|
| Greenstar Highflow CDi 60/100mm flues | 750mm | 1,500mm |
| Greenstar Highflow CDi 80/125mm flues | 750mm | 1,500mm |

Option 5: Extension flue upwards and horizontal



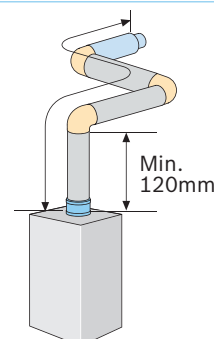
| Components | | | | |
|--|---------------|---------------|---------------|---------------|
| Part No. 100mm | 7 716 191 155 | 7 716 191 083 | 7 716 191 084 | 7 716 191 164 |
| Part No. 125mm | 7 716 191 157 | 7 719 003 666 | 7 719 003 664 | 7 716 191 165 |
| Maximum lengths (mm) & no. of components required | | | | |
| Greenstar Highflow CDi series | | | | |
| 100mm | 2,500 | 1 | up to 2 | 1 |
| 125mm | 11,000 | 1 | up to 10 | 1 |

Option 6: Extension flue upwards and horizontal using a second 90° bend



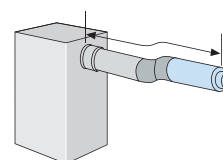
| Components | | | | |
|--|---------------|---------------|---------------|---------------|
| Part No. 100mm | 7 716 191 155 | 7 716 191 083 | 7 716 191 084 | 7 716 191 164 |
| Part No. 125mm | 7 716 191 157 | 7 719 003 666 | 7 719 003 664 | 7 716 191 165 |
| Maximum lengths (mm) & no. of components required | | | | |
| Greenstar Highflow CDi series | | | | |
| 100mm | 1,000 | 1 | up to 2 | 2 |
| 125mm | 9,000 | 1 | up to 8 | 2 |

Option 7: Extension flue upwards and horizontal using a third 90° bend



| Components | | | | |
|--|---------------|---------------|---------------|---------------|
| Part No. 100mm | 7 716 191 155 | 7 716 191 083 | 7 716 191 084 | 7 716 191 164 |
| Part No. 125mm | 7 716 191 157 | 7 719 003 666 | 7 719 003 664 | 7 716 191 165 |
| Maximum lengths (mm) & no. of components required | | | | |
| Greenstar Highflow CDi series | | | | |
| 100mm | N/A | N/A | N/A | N/A |
| 125mm | 7,000 | 1 | up to 6 | 3 |

Option 8: Side flue extension using two 45° bends



| Components | | | |
|--|---------------|---------------|---------------|
| Part No. 100mm | 7 716 191 155 | 7 716 191 083 | 7 716 191 085 |
| Part No. 125mm | 7 716 191 157 | 7 719 003 666 | 7 719 003 665 |
| Maximum lengths (mm) & no. of components required | | | |
| Greenstar Highflow CDi series | | | |
| 100mm | 2,500 | 1 | up to 2 |
| 125mm | 11,000 | 1 | up to 10 |

Note: The short flue extension (100mm dia.) may be used as an alternative to the standard extension as required up to the maximum flue lengths stated (Part No. 7 716 191 133). For high level horizontal flue discharges (options 5, 6 and 7) the flue adaptor (part number 8 718 682 324 0) may be required.

Note: The maximum flue length must be reduced by the following amounts for each bend used.

| | 45° bend | 90° bend |
|--|----------|----------|
| Greenstar Highflow CDi 60/100mm flues | 750mm | 1,500mm |
| Greenstar Highflow CDi 80/125mm flues | 750mm | 1,500mm |

Greenstar Highflow CDi combi boiler vertical fluing options

Greenstar Highflow CDi combis offer a choice of 2 different sized vertical RSF systems, 100mm diameter and 125mm diameter. Both systems have different maximum lengths. Options 1 to 3 detail the permissible lengths.

Vertical RSF flue



| Flue diameter | 100mm | 125mm |
|-------------------------------------|---------|----------|
| Flue terminal assembly diameter | 120mm | 135mm |
| Maximum flue length (inc. terminal) | 6,400mm | 15,000mm |
| Flue terminal assembly length | 1,140mm | 1,365mm |

Vertical balanced flue kit

Comprises:

- 1 x flue terminal assembly
- 1 x weather sealing collar
- 1 x fire stop spacer
- 1 x vertical flue adaptor
- 1 x wall bracket
- 1 x flue adaptor

Part No. 7 716 191 156 (100mm dia.)

Part No. 7 716 191 158 (125mm dia.)

Accessories

| Components | Part No. | Description |
|-----------------------|---------------|-------------------------------|
| 100mm diameter | | |
| | 7 716 191 156 | Vertical 1,140mm kit |
| | 7 716 191 083 | Extension flue kit (960mm*) |
| | 7 716 191 172 | 2m flue extension |
| | 7 716 191 133 | Short flue extension (220mm*) |
| | 7 716 191 084 | 90° bend |
| | 7 716 191 085 | 45° bend |
| | 7 716 191 090 | Flashing – flat roof |
| | 7 716 191 091 | Flashing – pitched roof |

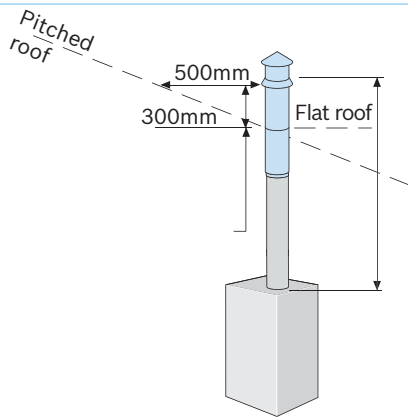
| | | |
|-----------------------|---------------|-----------------------------|
| 125mm diameter | | |
| | 7 716 191 158 | Vertical 1,365mm kit |
| | 7 719 003 666 | Extension flue kit (960mm*) |
| | 7 719 003 664 | 90° bend |
| | 7 719 003 665 | 45° bend |
| | 7 716 191 090 | Flashing – flat roof |
| | 7 716 191 091 | Flashing – pitched roof |



**Dimensions when fitted*

The following criteria should be noted when planning the installation:

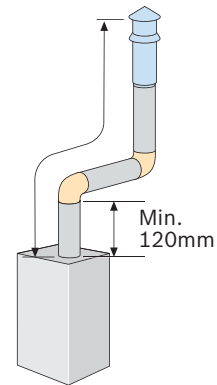
- Because the appliance operates at high efficiency, a white plume of condensation will be emitted from the terminal. Care must be taken when selecting the flue terminal position
- To achieve a maximum flue length, one of the extension flue kits will need to be cut so that the permitted maximum flue length is not exceeded
- Vertical flue options 1-3 illustrate common flue installations. Other configurations of the flue system are possible up to, and not exceeding, the stated maximum flue lengths.




Option 1: Vertical balanced flue assembly



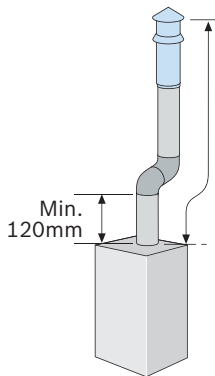
| Components | |  |  |
|---|--------|---|---|
| Part No. 100mm | | 7 716 191 156 | 7 716 191 083 |
| Part No. 125mm | | 7 716 191 158 | 7 719 003 666 |
| Maximum lengths (mm) & no. of components required | | | |
| Greenstar Highflow CDi series | | | |
| 100mm | 6,400 | 1 | up to 6 |
| 125mm | 15,000 | 1 | up to 14 |




Option 3: Vertical balanced flue using two 90° bends



| Components | |  |  |  |
|---|--------|---|---|---|
| Part No. 100mm | | 7 716 191 156 | 7 716 191 083 | 7 716 191 084 |
| Part No. 125mm | | 7 716 191 158 | 7 719 003 666 | 7 719 003 664 |
| Maximum lengths (mm) & no. of components required | | | | |
| Greenstar Highflow CDi series | | | | |
| 100mm | 3,400 | 1 | up to 3 | 2 |
| 125mm | 11,000 | 1 | up to 10 | 2 |

Option 2: Vertical balanced flue using two 45° bends



| Components | |  |  |  |
|---|--------|---|---|---|
| Part No. 100mm | | 7 716 191 156 | 7 716 191 083 | 7 716 191 085 |
| Part No. 125mm | | 7 716 191 158 | 7 719 003 666 | 7 719 003 665 |
| Maximum lengths (mm) & no. of components required | | | | |
| Greenstar Highflow CDi series | | | | |
| 100mm | 4,900 | 1 | up to 5 | 2 |
| 125mm | 13,000 | 1 | up to 12 | 2 |

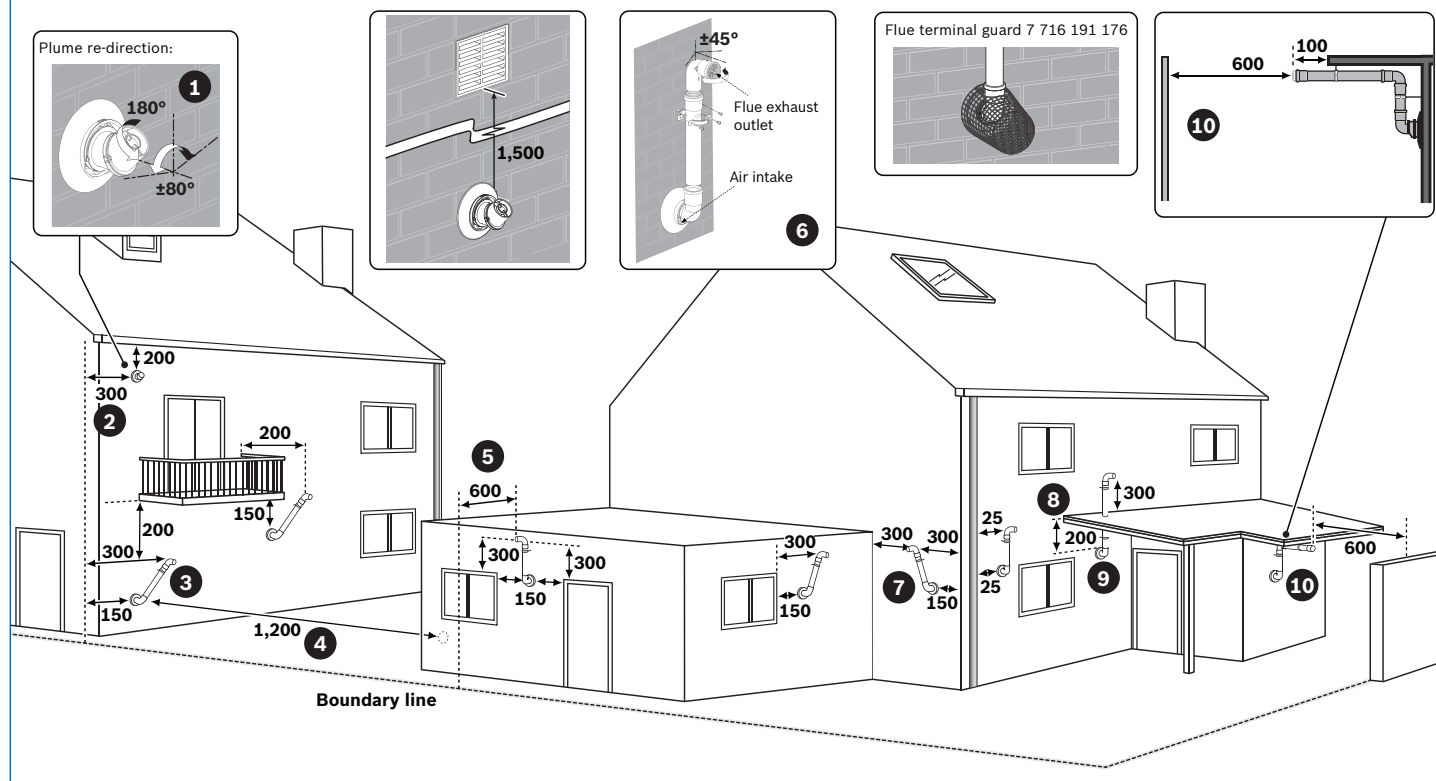
Note: The short flue extension (100mm dia.) may be used as an alternative to the standard extension as required up to the maximum flue lengths stated (Part No. 7 716 191 133).

Note: The maximum flue length must be reduced by the following amounts for each bend used.

| | 45° bend | 90° bend |
|---------------------------------------|----------|----------|
| Greenstar Highflow CDi 60/100mm flues | 750mm | 1,500mm |
| Greenstar Highflow CDi 80/125mm flues | 750mm | 1,500mm |

Plume management terminal positioning

All measurements in millimetres



Note

- All measurements are the minimum clearances required
- Refer to pages 24-25 for all concentric flue terminal positions unless the flue position is specified on the figure above "Plume terminal positions"
- Terminals must be positioned so as to avoid combustion products entering the building
- Support the flue at approximately one metre intervals and at a change of direction, use suitable brackets and fittings.

Key to illustration

1. This feature allows some basic plume re-direction options on a standard telescopic horizontal flue terminal. 300mm minimum clearances to an opening, e.g. window. However the minimum clearances to an opening in the direction that the plume management is facing, must be increased to 1,500mm. Where the flue is less than 150mm to a drainpipe, and plume re-direction is used, the deflector should not be directed towards the drainpipe.
2. 300mm adjacent to a boundary line.
3. Plume Management Kit air intake can be reduced to 150mm providing the flue exhaust outlet is no less than 300mm adjacent to a boundary line.
4. 1,200mm between terminals facing each other.
5. 600mm distance to a boundary line, unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines.

6. Using a Plume Management Kit, the air intake measurement can be reduced to 150mm providing the flue exhaust outlet has a 300mm clearance. Plume kits running horizontally must have a 10° fall back to the boiler for proper disposal of condensate. For details on specific lengths see relevant boiler Technical & Specification information.
7. Internal/external corners. The air intake clearance can be reduced to 150mm providing the flue exhaust outlet has a 300mm clearance.
8. Clearances no less than 200mm from the lowest point of the balcony or overhang.
9. 1,200mm from an opening in a car port on the same wall e.g. door or window leading into the dwelling.
10. 600mm distance to a surface facing a terminal, unless it will cause a nuisance. BS 5440: Part 1 recommends that care is taken when siting terminals in relation to surfaces facing a terminal.

- Installations in car ports are not recommended
- The flue cannot be lower than 1,000mm from the top of a light well due to the build up of combustion products
- Dimensions from a flue terminal to a fanned air inlet to be determined.

Plume management system options

Plume management system

60mm dia. plume management kit

- 1 x terminal bend
- 1 x extension 500mm
- 1 x outlet assembly
- 1 x clamp pack

Part No. 7 716 191 086

Accessories

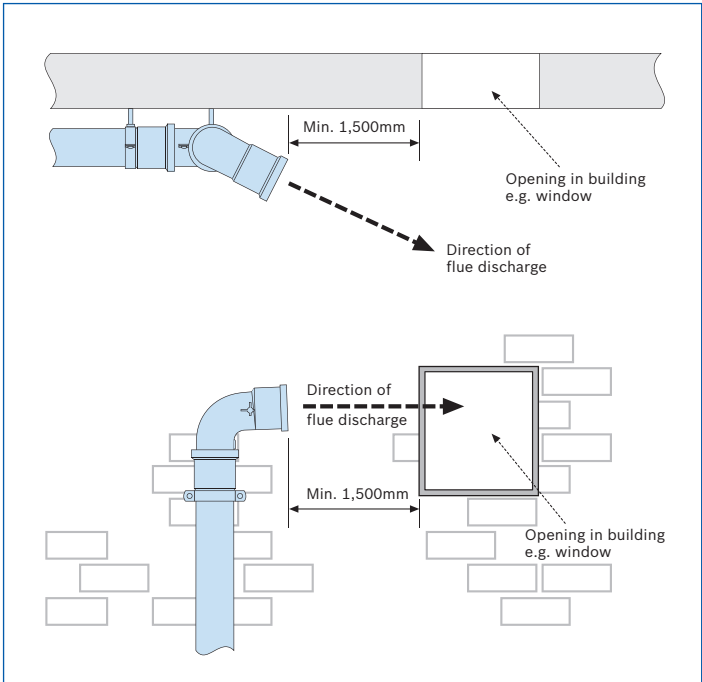
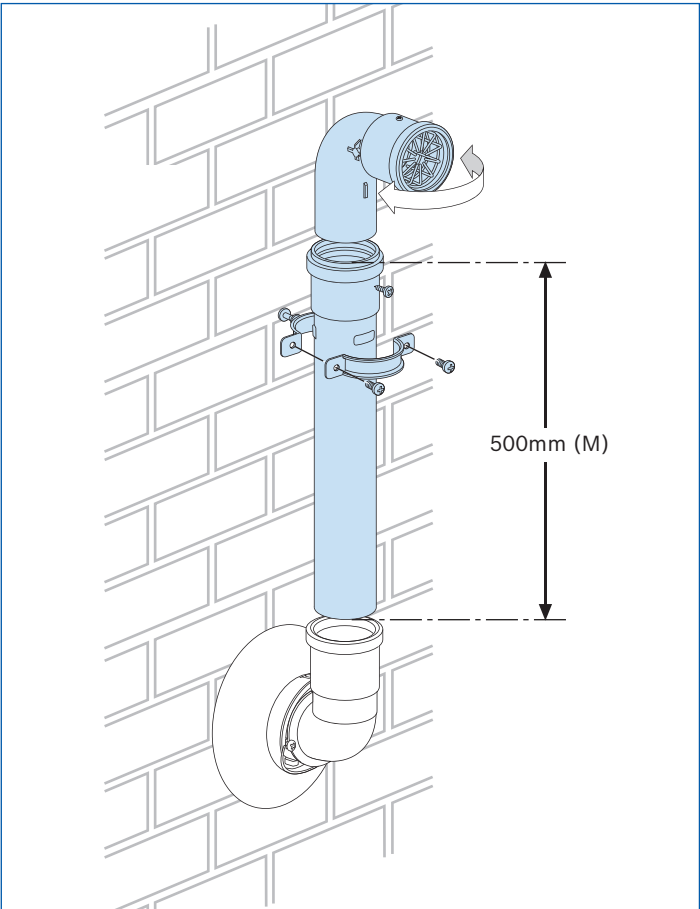


| Components | Part No. | Description |
|---------------|---------------|---------------------------------------|
| 60mm diameter | | |
| | 7 716 191 086 | Plume management kit |
| | 7 716 191 087 | Extension (1,000mm) |
| | 7 716 191 088 | 90° bend |
| | 7 716 191 089 | 45° bend (pair) |
| | 7 716 191 176 | Plume management terminal guard round |

Standard plume management system

The flue terminal outlet has built-in stops which limits the rotation for horizontal fluing, allowing the condensate to run back into the boiler for safe disposal. Do not attempt to force beyond the limit stops.

All plume management sections must rise by at least 173mm per metre (10°) from the terminal to ensure that condensate flows back into the boiler.



Re-directing flue discharge from a 60mm dia. plume management outlet

The maximum effective flue lengths (L) are stated opposite for the relevant appliance together with the minimum and maximum lengths (M) of the plume management system connected, these lengths must not be exceeded.

External plume management bends still need to be allowed for. See below.

60mm dia. plume management system

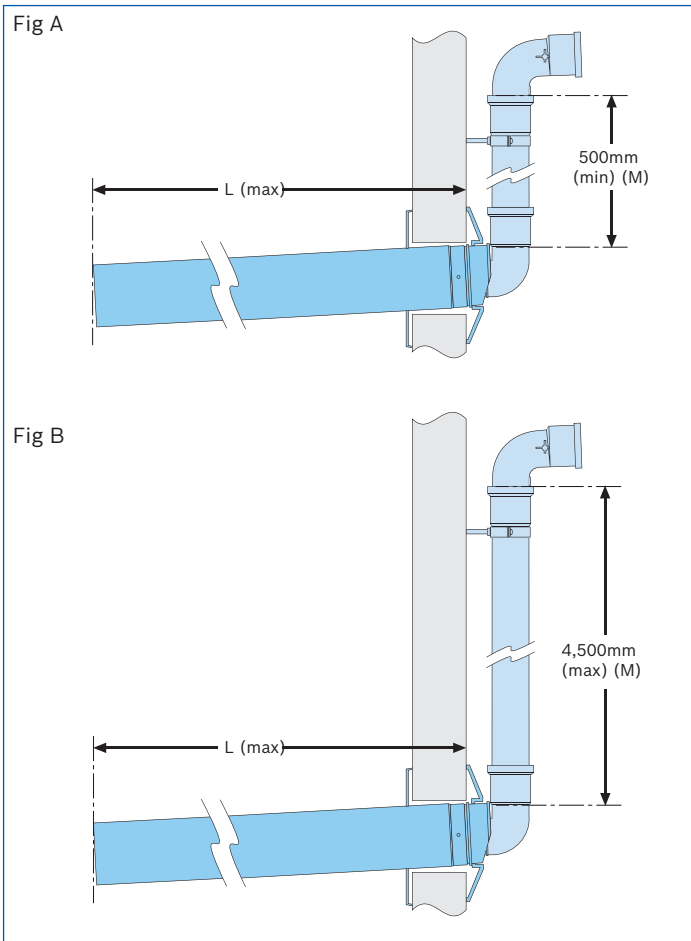
To ensure that the maximum total straight flue length along the plume management route is not exceeded, the following should be added to dimension (M):

- 1,500mm for each extra 90° bend
- 750mm for each extra 45° bend

For plume management options with 60mm dia. extensions, refer to page 34.

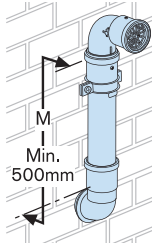
The effective flue length can be determined by adding together all the straight flue lengths and the effective lengths of the bends used, 2,000mm for each 90° bend and 1,000mm for each 45° bend.


Condensfit II™ telescopic flue and plume management system measuring



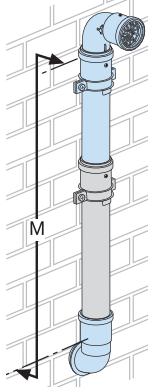
| Effective straight flue lengths for telescopic flue with plume management | | |
|---|--|--|
| Boiler | Fig. A Maximum straight flue length (L) with minimum plume management length 500mm (M) | Fig. B Maximum straight flue length (L) with maximum plume management length 4,500mm (M) |
| Highflow CDi series | 4,000mm | 1,200mm |


Plume management system



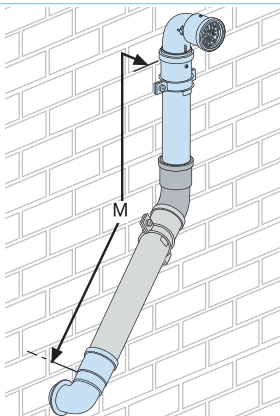
| Components | |  |
|---|-----|---|
| Part No. 60mm | | 7 716 191 086 |
| Maximum lengths (mm) & no. of components required | | |
| Greenstar Highflow CDi series* | | |
| 60mm | 500 | 1 |


Plume management system with extensions



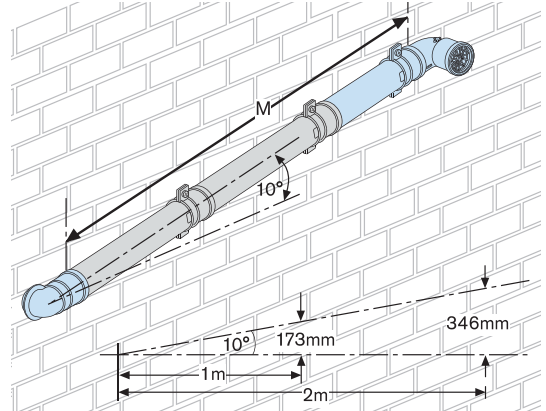
| Components | | |
|---|---------------|---------------|
|  | | |
| Part No. 60mm | 7 716 191 086 | 7 716 191 087 |
| Maximum lengths (mm) & no. of components required | | |
| Greenstar Highflow CDi series* | | |
| 60mm | 4,500 | 1 |
| | | up to 4 |


Plume management system with extensions and 45° bend



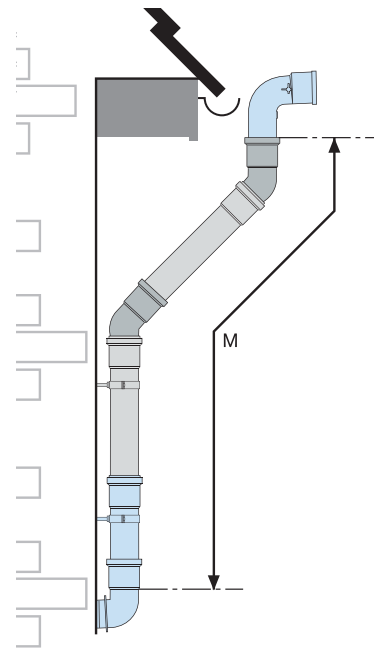
| Components | | | |
|---|---------------|---------------|---------------|
|  | | | |
| Part No. 60mm | 7 716 191 086 | 7 716 191 087 | 7 716 191 089 |
| Maximum lengths (mm) & no. of components required | | | |
| Greenstar Highflow CDi series* | | | |
| 60mm | 3,750 | 1 | up to 4 |
| | | | 1 |


Plume management system with angled termination



| Components | | |
|---|---------------|---------------|
|  | | |
| Part No. 60mm | 7 716 191 086 | 7 716 191 087 |
| Maximum lengths (mm) & no. of components required | | |
| Greenstar Highflow CDi series* | | |
| 60mm | 4,500 | 1 |
| | | up to 4 |

Plume management system with extensions and 45° bends



| Components | | | |
|---|---------------|---------------|---------------|
|  | | | |
| Part No. 60mm | 7 716 191 086 | 7 716 191 087 | 7 716 191 089 |
| Maximum lengths (mm) & no. of components required | | | |
| Greenstar Highflow CDi series* | | | |
| 60mm | 3,000 | 1 | up to 3 |
| | | | 2 |

***NOTE:** You must refer to the table on page 33 to calculate your horizontal flue lengths and plume management lengths.

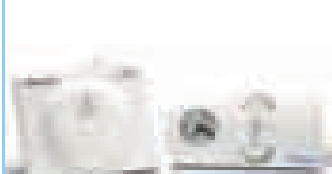
Greenstar Highflow CDi series accessories

MT10 mechanical timer



**Worcester Part No.
7 716 192 036**

**MT10RF mechanical
RF thermostat**



**Worcester Part No.
7 716 192 037**

**Comfort plug-in twin
channel programmer**



**Worcester Part No.
7 733 600 003**

**Comfort I RF wireless
room thermostat
and plug-in twin
channel programmer**



**Worcester Part No.
7 733 600 001**

**Comfort II RF wireless
programmable room
thermostat and
plug-in RF receiver**



**Worcester Part No.
7 733 600 002**

**FR10 intelligent
room thermostat**



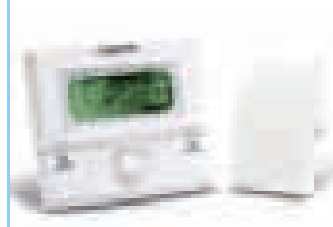
**Worcester Part No.
7 716 192 065**

**FR110 programmable
room thermostat**



**Worcester Part No.
7 716 192 066**

**FW100 weather
compensation controller**



**Worcester Part No.
7 716 192 067**

Wave



**Worcester Part No.
7 716 192 072**

**RS telescopic flue kit
(100mm dia.)**



**Worcester Part No.
7 716 191 155**

**Horizontal flue kit
(125mm dia.)**



**Worcester Part No.
7 716 191 157**

**Vertical BF kit
(100mm dia.)**



**Worcester Part No.
7 716 191 156**

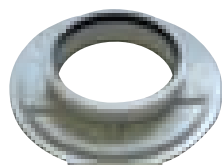
Greenstar Highflow CDi series accessories

**Vertical BF kit
(125mm dia.)**



**Worcestor Part No.
7 716 191 158**

**Vertical flue adaptor
(60/100mm)**



**Worcestor Part No.
7 716 191 164**

**Vertical flue adaptor
(80/125mm)**



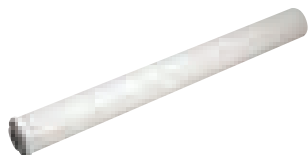
**Worcestor Part No.
7 716 191 165**

**1,000mm extension kit
(100mm dia.)**



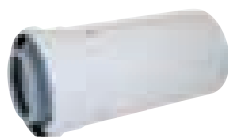
**Worcestor Part No.
7 716 191 083**

**2m flue extension
(100mm dia.)**



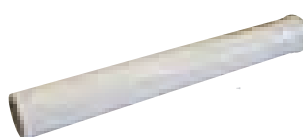
**Worcestor Part No.
7 716 191 172**

**Short flue extension
220mm (100mm dia.)**



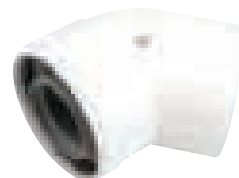
**Worcestor Part No.
7 716 191 133**

**1,000mm extension
(125mm dia.)**



**Worcestor Part No.
7 719 003 666**

**45° bend
(100mm dia.)**



**Worcestor Part No.
7 716 191 085**

**45° bend
(125mm dia.)**



**Worcestor Part No.
7 719 003 665**

**90° bend
(100mm dia.)**



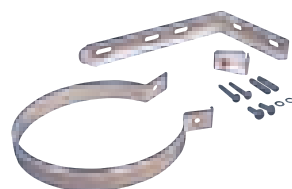
**Worcestor Part No.
7 716 191 084**

**90° bend
(125mm dia.)**



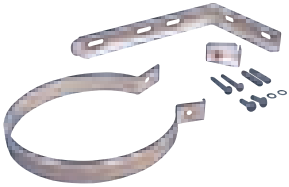
**Worcestor Part No.
7 719 003 664**

**Support bracket kit
(100mm dia.)**



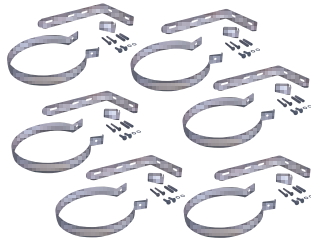
**Worcestor Part No.
7 716 191 092**

**Support bracket kit
(125mm dia.)**



**Worcester Part No.
7 716 191 174**

**Support bracket kit
6 pack (100mm dia.)**



**Worcester Part No.
7 716 191 173**

**Plume management kit
(60mm dia.)**



**Worcester Part No.
7 716 191 086**

**Extension
(60mm dia., 1,000mm)**



**Worcester Part No.
7 716 191 087**

**90° bend
(60mm dia.)**



**Worcester Part No.
7 716 191 088**

**45° bend
(60mm dia.)**



**Worcester Part No.
7 716 191 089**

Greenstar System Filter



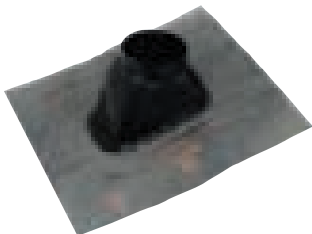
**Worcester Part No.
7 716 192 609**

**Flat roof flashing kit
(100mm & 125mm dia.)**



**Worcester Part No.
7 716 191 090**

**Pitched roof flashing kit
(100mm & 125mm dia.)**



**Worcester Part No.
7 716 191 091**

Total training experience from Land's End to John O'Groats

Worcester has always been committed to setting the industry standard for expert professional training and this is reflected in the scope and content of the courses, venues and options available.

We offer training on our entire range of domestic and commercial heating technologies as well as industry-led courses. All tuition is handled by expert heating specialists, combining classroom theory with, practical hands-on experience. Keep up-to-date with legislation and experience hands-on-training with our new technologies.

To increase your skills, expertise and value in the market place, trust Worcester's unique and proven total training concept.

Training centres throughout the UK

Worcester

Worcester's award-winning, state-of-the-art Training Academy is an innovative and spacious high tech training arena at our headquarters in Worcester. Facilities include open-plan domestic training areas with life-size single-storey brick buildings. Here installers can get to grips with Greenskies solar thermal systems working with Greenstar gas appliances, clearly demonstrating the importance of system design and operation.

Wakefield

Opened in Summer 2013, the Wakefield Training and Assessment Academy boasts a large gas laboratory which features our entire range of Greenstar gas-fired appliances, a flushing area, wet and dry boilers and a light commercial area with a cascade of Worcester GB162 boilers. It also contains a heat pump room with a full range of Greenstore ground source, Greensource air source and Greenstar Plus hybrid heat pumps with a courtyard for all external components. There is a solar room with fully working components from our entire Greenskies solar range and a pitched roof for practical training, as well as a large commercial training room.

West Thurrock and Clay Cross

Further academies are located at West Thurrock in Essex and Clay Cross in Derbyshire, both of which offer a comprehensive choice of courses.

College-linked Learning

As well as offering training at our own centres, Worcester has established close partnerships with many colleges around the UK, equipping them with our latest products.

Worcester has worked closely with leading colleges and independent training centres for more than 20 years – a successful enterprise which in 2007 was enhanced further with the launch of the College Links Learning Scheme.

Mobile training

We can also bring training to you. We have mobile vehicles fully equipped with operational Greenstar gas-fired boilers, dry strip-down models and even a Greensource air to air heat pump. Our 7.5 tonne mobile oil vehicle is also available for hands-on oil product training and OFTEC assessments.

Call now for more information 0330 123 0166.



Gas-fired product courses

As a market leader in gas-fired condensing boilers, we aim to ensure the highest levels of competence and expertise in the installation of all Worcester Greenstar gas-fired products. We run intensive training courses for installers, commissioning engineers and operatives involved with servicing and fault finding.

Our comprehensive gas-fired condensing boiler training courses include product overview, inspection and cleaning of components, CO and CO₂ analysis of flue gas, removal of compact hydraulics, service mode functions and fault finding on 'live and demo' appliances.

Gas-fired condensing boiler courses

- **Greenstar CDi Classic gas-fired condensing combi boilers.**
- **Greenstar CDi Compact and Greenstar Si Compact gas-fired condensing combi boilers.**
- **Greenstar i Junior gas-fired condensing combi boilers.**
- **Greenstar system & regular gas-fired condensing boilers.**
- **Greenstar Highflow CDi & FS CDi Regular floor standing gas-fired condensing combi and regular boilers.**
- **Greenstar Controls** (covers MT10, MT10RF, NEW Greenstar Comfort range, NEW Wave internet connected room thermostat, FR10, FR110, FW100, and ISM1).

| | Greenstar Overview | CDi Classic | CDi Compact & Si Compact | i Junior | System & Regular | Highflow CDi & FS CDi Regular | Controls |
|------------------------|--------------------|-------------|--------------------------|----------|------------------|-------------------------------|---|
| Duration | 1 Day | 1 Day | 1 Day | 1 Day | 1 Day | 1 Day | 1 Day |
| Cost | Free* | Free* | Free* | Free* | Free* | Free* | Free* |
| Training course covers | | | | | | | |
| Specification | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Guide to the varied range of control options that are available |
| Installation | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Commissioning | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Servicing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Maintenance | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Course locations | | | | | | | |
| Worcester | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Clay Cross | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ |
| Wakefield | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| West Thurrock | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ |
| College Links† | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ |
| Mobile† | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✓ |

*A holding fee of £65 applies to free courses and is refunded on attendance of the course. If a booking is cancelled more than 10 working days before the course date, the fee will be fully refunded. The fee is non-refundable if a cancellation is made less than 10 working days before the course date.

†Please contact Worcester Training for specific colleges and mobile dates.



Additional product and industry training courses

The diversity of products in today's heating industry gives you the opportunity to expand your expertise, whilst offering more choice to your customers. Worcester provides comprehensive training from all its academies on its entire range of technologies. Call us on **0330 123 0166** to order a full course training brochure or to book yourself onto a training course, alternatively, you can visit **www.worcester-bosch.co.uk/training**

Gas-fired product courses

- **Greenstar CDi Classic** gas-fired condensing combi boilers.
- **Greenstar CDi Compact** and **Greenstar Si Compact** gas-fired condensing combi boilers.
- **Greenstar i Junior** gas-fired condensing combi boilers.
- **Greenstar system & regular** gas-fired condensing boilers.
- **Greenstar Highflow CDi & FS CDi Regular** floor standing gas-fired condensing combi and regular boilers.
- **Greenstar Controls** (covers MT10, MT10RF, NEW Greenstar Comfort range, NEW Wave internet connected room thermostat, FR10, FR110, FW100, and ISM1).

Renewable product courses

- **Renewables overview.**
- **Greenskies solar.**
- **Greenskies advanced solar.**
- **Introduction to heat pumps.**
- **Greenstore LECP** ground source heat pumps.
- **Greensource** air to air heat pumps.
- **Greensource** air to water heat pumps.
- **Greensource** split air to water heat pumps.

Worcester commercial product courses

- **Greenspring CWi47** water heater.
- **GB162** overview.
- **GB162** domestic.
- **GB162** commercial.
- **Greenstar Heat Distribution Unit.**
- **Commercial ACS** training and assessment – CODNCO1.

Bosch commercial product courses

- **GB312 & GB402** overview.
- **Solar thermal** product overview.
- **GWPL Gas Absorption Heat Pumps** overview.
- **CHP** overview.
- **Commercial controls** overview.

Industry focused courses

- **Hot water systems & safety.**
- **Chemical water treatment.**
- **Construction skills F-Gas** training/assessment certification.
- **IDHEE** domestic heating design.
- **Domestic ACS** training and assessment – reassessment. CCN1 + 3 appliances.
- **QCF Level 3 Award**
 - Air source and ground source heat pumps.
 - Air to water and split air to water heat pumps.
 - Solar thermal.
- **MCS Made Easy.**
- **Green Deal.**
- **LPG Changeover.**
- **WRAS Water Regulations.**
- **Energy Efficiency.**



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As part of the worldwide Bosch Group, Worcester strives to maintain the highest possible standards of after-sales care.

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Should you require support, our award winning Contact Centre team, based at our head office in Worcester, are ready to take your calls. Whatever your query our contact centre operators along with our nationwide team of engineers are ready to help you.

Tel: 0330 123 9559

Opening times

Monday – Friday: 7.00am – 8.00pm

Saturday: 8.00am – 5.00pm

Sunday: 9.00am – 12 noon

Bank Holidays: 8.00am – 4.30pm



Spares

Genuine replacement parts for all supported Worcester products are readily available from stock, or on a next day delivery basis. Visit www.worcester-bosch.co.uk/spares to find your local stockist.

Customer Technical Support

The Worcester Technical Helpline is a dedicated phone line – committed to providing a comprehensive service to complement the brand name and quality of our products. Our experienced team of technical experts provides answers to queries of a technical nature across the entire Worcester range.

Technical Support

Tel: 0330 123 3366

Fax: 01905 752 741

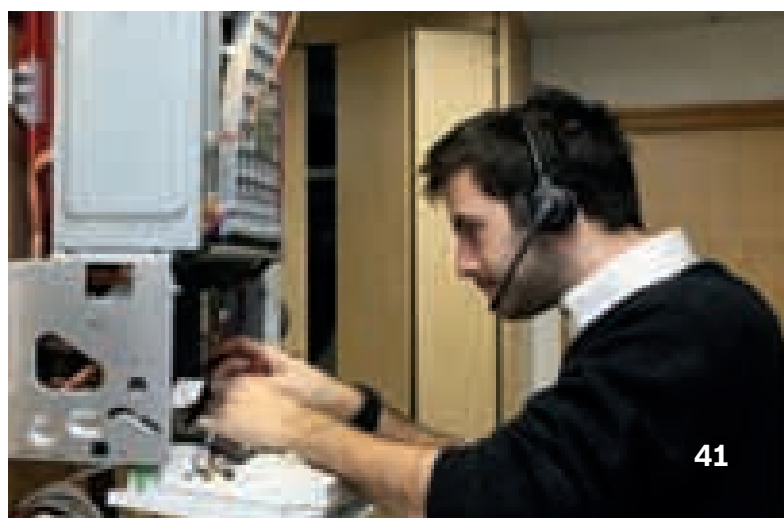
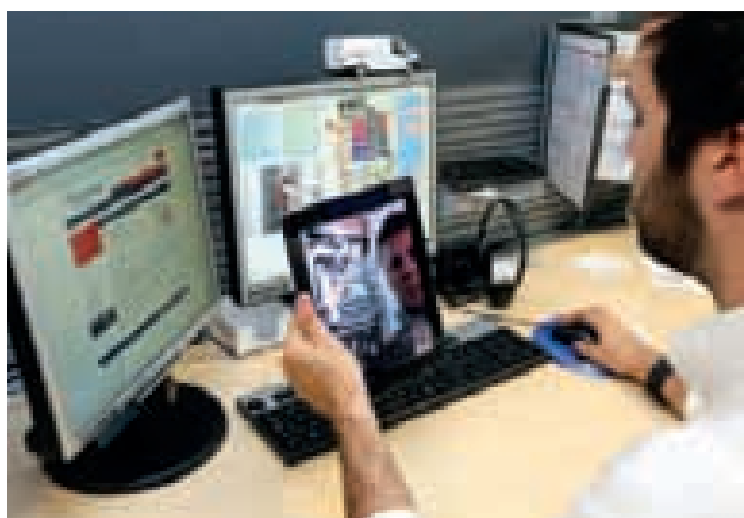
Email: technical-advice@uk.bosch.com

Opening times

Monday – Friday: 7.00am – 8.00pm

Saturday: 8.30am – 4.00pm

Bank Holidays: 8.00am – 4.30pm



Useful numbers

Sales

Tel: 0330 123 9669
sales.mailbox@uk.bosch.com

Spare Parts

Tel: 0330 123 9779
spares.mailbox@uk.bosch.com

Technical Helpline (Pre & Post Sales)

Tel: 0330 123 3366
technical-advice@uk.bosch.com

Renewables Technical Helpline

Email: renewable-advice@uk.bosch.com
or telephone 0330 123 9229

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please visit our website
www.worcester-bosch.co.uk/registration
or telephone 0330 123 2552

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These rules apply to calls from any type of line, including mobile, BT, other fixed phone line or payphone. Calls from mobiles and some other networks may vary.
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Cotswold Way, Warndon,
Worcester, WR4 9SW